Attachment 1

Technical Specifications
Advanced Traffic Signal Controller Software

JANUARY 2012

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Advanced Traffic Signal Controller Software Specification

INTRODUCTION

The Cities of Fort Worth, Dallas, and Richardson Texas (the Cities) plan to transition from their existing Model 170 local controller to the Advanced Transportation Controller (ATC). As part of the transition, the Cities will procure new Local Controller Software that meets the existing and future needs of the Cities. This document specifies the minimum and desirable requirements of the local controller software.

ATC SPECIAL PROVISIONS

The Cities have incorporated the ATC Standards into their ATC Special Provisions. The Cities' ATC Special Provisions modify and enhance the ATC Standard to meet the specific needs of the Cities. The selected local controller software shall be fully compatible with the Cities' ATC hardware. A copy of the City's ATC Special Provisions is available upon request.

CONCEPT OF OPERATIONS DOCUMENT

The Cities have defined their desired functionality for signalized intersections in its document entitled *Concept of Operation for Local Intersection Operation*. This document is included in the appendix. If, in the opinion of the selected provider, the requirements presented in this document will not provide that functionality, it is the responsibility of the controller software provider to document and provide those deficiencies to the Cities. The deficiencies list shall be provided to the Cities as part of the proposal.

CURRENTLY AVAILABLE SOFTWARE

The City expects that Commercially available Off-The-Shelf (COTS) software will meet, at a minimum, all of the minimum requirements defined in this document. To be considered as COTS software, the proposed software should be currently available and operating in the field at a minimum of 50 intersections.

CABINET TYPES

The proposed software shall be easily configurable to operate in the Type 332 family of 170 cabinets (332/336/337), the NEMA TS1 and TS2 type 1 cabinets, and the ITS family of cabinets as defined in the ITS Cabinet Standard v1.02.17b (or latest version).

NEMA REQUIREMENTS

Where not specifically defined in this document, the proposed local controller software shall meet or exceed the requirements defined in Section 3 of the NEMA Standards Publication TS 2-2003 v.02.06, Traffic Control Assemblies with NTCIP Requirements. The requirements defined in this document enhance, expand, or are in addition to the requirements defined in the NEMA publication.

COMPLIANCE

The provided software shall be in strict adherence to the following:

- Applicable National Transportation Communication for ITS Protocol (NTCIP) standards as defined in the appendix.
- The project requirements presented in this document.

If strict adherence to both conflict, compliance to the project requirements shall prevail.

All Proposers must be able to demonstrate to the City's satisfaction that their proposed controller software is in full compliance with the provisions of this specification including all web browser interface provisions.

FUNCTIONAL REQUIREMENTS

1 GENERAL AND ADMINISTRATIVE

1.1 GENERAL

1.1.1 The software shall provide a means for the user to define general information, settings, and preferences.

1.2 INTERSECTION INFORMATION

1.2.1 The software shall support the following user defined intersection information

1.2.1.1 Intersection name

1.2.1.2 Intersection ID number

1.2.1.3 Street 1

1.2.1.4 Street 2

1.3 CONTROLLER INFORMATION

1.3.1 The software shall provide the following controller information

1.3.1.1 Current active software version

1.3.1.2 Available software upgrade

1.3.1.3 The software shall indicate that a new software version is available and has been downloaded to the flash memory in the controller.

1.4 SOFTWARE UPGRADES

1.4.1 The City shall be automatically notified by the vendor when software upgrades are available.

1.4.1.1 The automatic notice shall include a description of changes to the software.

1.4.2 The software shall allow users to download upgrades to the local controller software from a remote location.

1.4.3 The upgraded software shall reside in flash memory in the local controller unit and not automatically replace the existing software in the controller unit.

1.4.3.1 If the software upgrade is considered minor, the user shall be able to remotely replace the existing software while the controller is still operating and shall not require a controller restart.

1.4.3.2 If the software upgrade is considered major, a controller restart shall be required to replace the existing software.

1.4.3.3 A major upgrade shall not take place in the event of a power failure.

1.4.3.4 The software provider shall submit their definition of minor and major upgrades for City approval.

1.4.4 The software shall verify that the upgraded software was successfully downloaded to the controller unit without errors.

1.5 COPY/PASTE

1.5.1 The software shall provide a copy and paste capability for user entered parameters. The functionality shall be available for individual cells, rows, columns, and full tables.

1.6 SAVE CHANGES

1.6.1 The software shall require the user to confirm any changes to the controller database prior to accepting the change.

1.6.2 All changes shall become highlighted and be reviewable prior to acceptance.

1.6.3 Changes shall take effect upon confirmation by the user.

1.7 COMPATIBILITY WITH EXISTING INFRASTRUCTURE

1.7.1 A template shall be provided for the inputs and outputs of standard 332, 332A, 336S, 337, and 337S cabinets.

1.7.2 The software shall support monitoring of the existing conflict monitor/malfunction monitor unit.

1.8 INDUSTRY STANDARD NOMENCLATURE

1.8.1 All names, labels, and other descriptions within the software shall use industry standard, easily understood nomenclature. All nonstandard nomenclature shall be approved by the City.

1.8.2 Any new software development shall follow industry standard software development.

1.9 SECURITY

1.9.1 The software shall enable/deny access to the controller through user passwords. User access and passwords shall be definable by the software administrator. The user shall be required to change their password after an amount of time in days defined by the system administrator.

1.9.1.1 Security levels shall include view only, access to change timing parameters only, access to change configuration of phasing.

1.9.1.2 As security levels increase, the user will be able to access and change more features in the software and each level shall include access to all lower levels.

1.9.1.3 The software shall log the user ID, date and time of log-in and log-out and any changes the user made.

1.9.1.4 The software shall automatically logout the last user after a user specified amount of time has passed where there was no front panel activity or activity from a remote connection.

1.9.2 The software shall provide access from approved remote equipment only.

1.9.2.1 The user shall be able to enable/disable this feature.

1.9.2.2 The software shall maintain a "MAC Allow Table" containing the MAC addresses of all approved equipment.

1.9.2.3 When the software identifies non-approved equipment, it shall query the supervisory software (through an SNMP trap) in an attempt to validate the equipment. If the equipment MAC address is validated, the equipment shall be approved and the MAC address added to the MAC Allow Table.

1.9.2.4 The software local MAC Allow Table shall be regularly updated from the Supervisory software.

1.9.2.5 Users with proper access privileges shall be able to enter an Equipment MAC Address into the software via the front panel.

1.10 WEB BROWSER

1.10.1 The software shall provide a controller resident web server that exposes all NTCIP object via a web interface.

1.10.1.1 Objects should be capable of being edited with Internet explorer 5 and higher, Firefox 1.0 and higher, Safari 1.0 and higher Ethernet connected web client browser.

1.10.1.2 There shall not be any step necessary to install extra software on the web client browser. As long as the user's web browser meets the specified requirements, the user shall be able to view all the status objects and edit all read/write parameter objects.

1.10.2 Web User interface object support

1.10.2.1 The web application shall support all the objects that users can set on the controller using the controllers' front panel User Interface. This shall support all the standard NTCIP 1201:2005 and NTCIP 1202:2005 objects and all manufacturer specific objects.

1.10.3 Status objects

1.10.3.1 The status objects should be refreshed by the web interface automatically (without the need for the users to refresh pages in their web browser manually). The refresh shall have a latency of less than 2/10 of a second after a value change occurs.

1.10.4 Web server Mib parameters

1.10.4.1 A manufacturer specific NTCIP read/write object shall be used for configuring the network port number which the web server listen to. The Default Port number shall be 80.

1.11 DAYLIGHT SAVINGS TIME

1.11.1 The software shall provide the capability to automatically adjust the controller clock to reflect daylight savings time (DST). Dates and time for the start and end of DST shall be user programmable.

1.11.2 By default, DST shall be enabled.

2 CONFIGURATION

2.1 CONFIGURATION TABLES

2.1.1 The software shall provide a minimum of five (5) tables for configuring the software.

2.2 CABINET CONFIGURATION

2.2.1 The user shall be able to select the cabinet type.

2.2.1.1 Default configuration tables shall be provided for 332, 332A, 336S, 337, 337S, and ITS model cabinets.

2.2.2 The software shall be capable of configuring the maximum number of channel outputs or detector inputs available in the ITS model cabinets.

2.2.3 The software shall provide a minimum of 128 user definable input pins.

2.2.4 The software shall provide a minimum of 128 user definable output pins.

2.2.5 The software shall allow the user to redirect any vehicle phase, pedestrian phase, or overlap output by changing the pin assignment.

2.3 RING BARRIER CONFIGURATION

2.3.1 The software shall allow the user to program the ring and barrier structure.

2.3.2 The software shall provide a minimum of eight (8) concurrent rings and 12 barriers.

2.3.3 The user shall be able to program one instance of every phase in the ring and barrier sequence.

2.3.3.1 The user shall be able to program phases even if they are not permitted.

2.3.4 The user shall be able to make changes to the active ring and barrier structure while the software is running the traffic light.

2.3.4.1 The software shall prompt the user to put the intersection into flash or continue.

2.3.4.1.1 If the user elects to continue without putting the intersection into flash, the software shall provide diagnostics to evaluate the proposed changes and determine if the controller needs to restart to implement the proposed changes.

2.3.4.1.2 If a restart is needed, the controller shall prompt the user to put the intersection into flash to implement changes.

- The user shall be able to override the software and continue without restart.

2.3.4.1.3 If controller is not put into flash and the user leaves the prompt screen, the changes will be lost.

2.3.4.2 The changes shall take effect when the user confirms the changes and the local cycle timer reaches the zero point or the last barrier is crossed.

2.4 START UP CONFIGURATION

2.4.1 The user shall be able to define the initial operation of the controller upon startup.

2.4.2 The user shall be able to select the following startup parameters:

2.4.2.1 Primary Startup Phases

2.4.2.1.1 The primary startup phases shall display solid yellow followed by solid all-red.

2.4.2.2 Secondary Startup Phases

2.4.2.2.1 Secondary Startup phases will serve after the primary startup phases but prior to starting normal operation.

2.4.2.2.2 The secondary startup phases shall display green immediately after the end of the primary startup phases.

2.4.2.3 Startup Flash

2.4.2.3.1 Enabling this feature will cause the intersection to startup in flash.

2.4.2.4 Flash Yellow

2.4.2.4.1 The selected phases shall flash yellow during programmed flash operation. All other phases shall flash red.

2.4.2.5 Startup All-Red Clearance

2.4.2.5.1 Enabling this feature will cause the intersection to display a steady red indication before beginning normal operation.

2.4.2.6 Vehicle Call Disable

2.4.2.6.1 The user shall be able to identify any vehicle phase that will not receive an automatic call upon startup.

2.4.2.6.2 By default all vehicle phases shall be receive a call upon startup.

2.4.2.7 Pedestrian Call Disable

2.4.2.7.1 The user shall be able to identify any pedestrian phase that will not receive an automatic call upon startup.

2.4.2.7.2 By default all pedestrian phases shall be receive a call upon startup.

2.4.3 The user shall be able to set the following startup timing parameters. When values are entered in the startup table for these parameters, the controller will time these values instead of the values entered for normal operations

2.4.3.1 Primary Startup (0-25.5 sec)

2.4.3.2 Secondary Startup (0-25.5 sec)

2.4.3.3 Startup minimum green (0-255 sec)

2.4.3.4 Startup Flash (0-255 sec)

2.4.3.5 Startup All Red Clearance (0-10 sec)

2.5 PROGRAMMED FLASH CONFIGURATION

2.5.1 The user shall be able to define the programmed flash operation of the controller.

2.5.2 The controller shall not enter flash operation unless all traffic lights are red.

2.5.3 When scheduled or commanded to change to program flash operation, the software shall place minimum recalls on the last phases before flash. After beginning flash operation, the controller shall remove existing vehicle and pedestrian calls and ignore all calls during flash operation.

2.5.4 The software shall end programmed flash by providing a green light for the selected exit phase.

2.5.5 The user shall be able to select the following programmed flash parameters by phase:

2.5.5.1 Flash Entry Phases

2.5.5.1.1 Flash entry phase will be served before the controller enters program flash.

2.5.5.1.2 If the flash entry phases do not end at the same time, the controller will enter flash mode during the first all-red period after one of the phases has been served.

2.5.5.2 Flash Exit Phases

2.5.5.2.1 Flash exit phases shall serve as the startup phases following the end of program flash.

2.5.5.2.2 If no exit phases are selected, the secondary startup phases shall be used.

2.5.5.3 Flash Yellow

2.5.5.3.1 The selected phases shall flash yellow during programmed flash operation. All other phases shall flash red.

2.5.5.4 Vehicle Call

2.5.5.4.1 The user shall be able to identify any vehicle phase that will receive an automatic call when switching from program flash to normal operation.

2.5.5.4.2 By default all vehicle phases shall not receive a call when exiting program flash.

2.5.5.5 Pedestrian Call

2.5.5.5.1 The user shall be able to identify any pedestrian phase that will receive an automatic call when switching from program flash to normal operations.

2.5.5.5.2 By default all pedestrian phases shall not receive a call when exiting program flash.

2.5.5.6 Alternate Flash Hertz

2.5.5.6.1 The selected phase shall show red when non-selected phases are dark and vice versa.

2.5.5.7 All Red Clearance Time

2.5.5.7.1 The user shall be able to select the amount of all-red time that will be displayed following the end of program flash.

2.5.5.7.2 The duration of the all-red clearance time shall be user definable for 0-25.5 seconds.

2.5.5.7.3 If the all-red clearance time is 0.0 seconds, the flash exit phases shall immediately display green.

2.6 MANUAL CONTROL CONFIGURATION

2.6.1 The user shall be able to program an alternate sequence for operation during manual control. The user shall be able to remotely apply and remove vehicle and pedestrian calls.

2.6.2 The software shall provide an option to enable/disable manual control.

3 DETECTION

3.1 GENERAL

3.1.1 Vehicle Detectors

3.1.1.1 The software shall support a minimum of 72 programmable vehicle detectors per intersection.

3.1.1.2 All vehicle detectors shall be capable of collecting volume and occupancy data.

3.1.1.2.1 Detector data shall be aggregated in 5 minute increments.

3.1.1.2.2 User shall be able to identify movements associated with each detector.

3.1.2 Pedestrian Detectors

3.1.2.1 The software shall support a minimum of 12 programmable pedestrian detectors per intersection.

3.1.3 System Detectors

3.1.3.1 The user shall be able to assign any detector as a system detector.

3.1.3.2 The software shall support a minimum of 16 system detectors.

3.1.4 Queue Detectors

3.1.4.1 The user shall be able to assign any detector as a queue detector.

3.1.4.2 The user shall be able to assign a minimum of eight (8) queue detectors.

3.1.5 Description

3.1.5.1 The user will be able to enter a text description of each detector. The description field shall be at least 18 characters.

3.1.6 Multiple Detector Tables

3.1.6.1 The software shall provide a minimum of four (4) unique, user definable detector tables.

3.2 GLOBAL DETECTOR PARAMETERS

3.2.1 The software shall allow users to define the following detection parameter values that apply to all enabled detectors.

3.2.1.1 Vehicle On Time Fail

3.2.1.1.1 The user shall be able to select the amount of time in minutes that the detector must be in a constant on state before it is reported failed.

3.2.1.1.2 Acceptable input value shall range from 0 to 1440 minutes.

3.2.1.2 Vehicle Off Time Fail

3.2.1.2.1 The user shall be able to select the amount of time in minutes that the detector must be off before it is reported failed.

3.2.1.3 Pedestrian On Time Fail

3.2.1.3.1 The user shall be able to select the amount of time in minutes that the pedestrian detector must be in a constant on state before it is reported failed.

3.2.1.4 Pedestrian Off Time Fail

3.2.1.4.1 Enable – the user shall select if this parameter is active in the software.

3.2.1.4.2 The user shall be able to select the amount of time in minutes that the pedestrian detector must be off before it is reported failed.

3.2.1.5 Erratic Activity Fail

3.2.1.5.1 The user shall be able to select the number of actuations (per minute) that the detector must exceed before it is reported failed.

3.3 DETECTOR CONFIGURATION

3.3.1 The software shall be able to configure the following detector types:

3.3.1.1 Vehicle

3.3.1.2 Pedestrian

3.3.1.3 System

3.3.1.4 Queue

3.4 VEHICLE DETECTOR CONFIGURATION

3.4.1 The software shall provide the following user selected configuration parameters for vehicle detection.

3.4.1.1 Enable

3.4.1.2 Call

3.4.1.3 Extend

3.4.1.4 Terminate

3.4.1.4.1 Detector enabled as a terminate detector shall cause the controller to immediately end the selected phase.

3.4.1.5 Yellow Lock

3.4.1.5.1 If yellow lock is used for a left turn phase, the user shall be able to define the permitted phases for the left turn. The software shall not lock the call until the protected and permitted phases for the left turn are yellow.

3.4.1.6 Red Lock

3.4.1.6.1 If red lock is used for a left turn phase, the user shall be able to define the permitted phases for the left turn. The software shall not lock the call until the protected and permitted phases for the left turn are red.

3.4.1.7 Pedestrian Input

3.4.1.7.1 When enabled, the detector shall call the pedestrian phase associated with the vehicle phases programmed for the input.

3.4.1.8 Phase Assignment

3.4.1.8.1 The software shall allow at least eight (8) vehicle phases to be assigned to each detector.

3.4.1.9 Overlap Assignment

3.4.1.10 Detector Disable (Type 3)

3.4.1.10.1 This parameter shall reset the phase extension timer for the phases associated with this input until the green has been active for the number of seconds defined by the user.

3.4.1.10.2 Once the extension timer for this detector reaches zero, the detector shall be disabled.

3.4.1.10.3 Once a detector input is disabled it shall not become active until the phase begins its clearance interval.

3.4.1.10.4 The phase associated with that detector.

3.4.1.11 Delay disabled when leading

3.4.1.11.1 The user shall be able to disable the detector delay for leading left turns.

3.4.2 The software shall provide the following user definable timing parameters for vehicle detection.

3.4.2.1 Delay

3.4.2.2 Extension

3.4.2.3 Detector Disable

3.4.2.4 Extension Time

3.4.2.5 Added Initial

3.5 PEDESTRIAN DETECTOR CONFIGURATION

3.5.1 The software shall provide the following user selected pedestrian detector configuration parameters:

3.5.1.1 Enable

3.5.1.2 Phase Assignment

3.5.1.3 Overlap Assignment

3.6 SYSTEM/COUNT DETECTOR CONFIGURATION

3.6.1 Each detector input shall be capable of functioning as a system detector

3.6.1.1 Detectors shall accumulate volume and occupancy data on a per cycle basis.

3.6.1.2 The user shall be able to set the time increment in minutes for the aggregation of volume and occupancy information.

3.6.1.3 User shall be able to set the time of day/day of week to collect volume and occupancy data.

3.6.1.4 The user can also choose to have data continuously collected.

3.7 DETECTOR INPUT FAILURE

3.7.1 In the event of a detector failure, the software shall automatically generate an alarm and transmit the alarm to the traffic management system.

3.7.2 The software shall automatically change detector setting when a detector linked to another detector fails.

3.7.2.1 A detector shall automatically change from call only to call and extend.

3.7.2.1.1 This shall occur when the stop detector is only used to call the phase and the setback detector is used to call and extend the phase. The stop detector shall change to call and extend if the setback detector fails.

3.7.2.2 A detector shall automatically change from time before detector disable to extend.

3.7.2.2.1 This shall occur when the stop detector has a time before detector disable programmed and the setback detector is used to call and extend the phase. The stop detector shall change to call and extend if the setback detector fails.

3.7.3 The user shall be able to select any of the following modes in the event of a detector failure:

3.7.3.1 None

3.7.3.2 Minimum Recall

3.7.3.3 Maximum 1 Recall

3.7.3.4 Maximum 2 Recall

3.7.3.5 Maximum 3 Recall

3.8 REMOTE RESET

3.8.1 The software shall allow the detectors to be reset remotely.

4 PHASE PARAMETERS

4.1 GENERAL

4.1.1 The software shall provide a minimum of 32 vehicular phases.

4.1.1.1 The user shall be able to label each vehicle phase in the phase parameters table.

4.1.1.1.1 Each text label shall be at least six characters.

4.1.1.1.2 The vehicle phase label in a phase parameters table shall remain blank until the user enters a label or copies a label from another phase parameter table.

4.1.2 The software shall provide a minimum of 12 pedestrian phases.

4.1.2.1 The user shall be able to label each pedestrian phase in the phase parameters table.

4.1.2.1.1 Each text label shall be at least six characters.

4.1.2.1.2 The pedestrian phase label in a phase parameters table shall remain blank until the user enters a label or copies a label from another phase parameter table.

4.1.3 All changes to phase parameters shall become active at the beginning of the next local cycle or when the controller crossed the last barrier in the ring structure.

4.1.4 The software shall provide configuration for Pedestrian Hybrid Signals as described in Section 4.9.

4.2 MULTIPLE PHASE PARAMETER TABLES

4.2.1 The software shall provide a minimum of thirty-two (32) programmable tables of phase parameters.

4.3 PHASE CONFIGURATION

4.3.1 The software shall allow the user to select the following phase configuration parameters:

4.3.1.1 Vehicle Phase Enable

4.3.1.2 Pedestrian Phase Enable

4.3.1.3 Exclusive Vehicle Phases

4.3.1.4 Exclusive Pedestrian Phases

4.3.1.5 Restricted Phases (conflicting phases)

4.3.1.5.1 The user shall enter a pair of phases in a field. A compatibility table does not meet this requirement.

4.3.1.5.2 If the active phase is entered as a restricted phase and that phase is active, it will prevent the other phases entered as restricted phases from becoming active. The ring with the other phase will red rest until the active phase ends.

4.3.1.5.3 If two restricted phases try to turn green at the same time the controller shall select one phase, and then stop the other phase from turning green.

4.3.1.6 Disable Minimum Yellow

4.3.1.6.1 When enabled the software shall be able to output yellow times less than 3.0 seconds.

4.3.1.6.2 If this feature is not active, the controller shall output at least a 3.0 second yellow.

4.3.1.7 Split Ring

4.3.1.7.1 When enabled, the software shall operate each ring independently.

4.3.1.7.2 When enabled, this feature will disable any common barriers between the active rings in the active ring-barrier programming.

4.3.1.7.3 When enabled, the user shall be able to coordinate the rings so barriers are crossed at the same time in the local cycle. This shall not prevent one ring from crossing the barrier even if other rings are not ready.

4.3.1.8 Every Other Cycle

4.3.1.8.1 The phase will be served every other cycle; in other words, the phase will be omitted every other cycle.

4.3.1.8.2 The user shall be able to select if the phase is served during odd or even cycles.

4.3.1.9 Minimum Recall 1

4.3.1.10 Minimum Recall 2

4.3.1.11 Maximum Recall 1

4.3.1.12 Maximum Recall 2

4.3.1.13 Maximum Recall 3

4.3.1.14 Soft Recall

4.3.1.14.1 Soft Recall provides a recall to the selected phases in the absence of any other vehicle or pedestrian calls.

4.3.1.15 Conditional Service

4.3.1.15.1 Conditional Service allows selected phases to be served out of the set sequence provided all the conditions below are met:

4.3.1.15.2 A phase in the same ring is green and ready to terminate.

4.3.1.15.3 A phase in another ring is green and has enough split time or max time to serve the conditional service max time for the conditional service phase.

4.3.1.16 Pedestrian Walk 1

4.3.1.17 Pedestrian Walk 2

4.3.1.18 Pedestrian Clearance 1

4.3.1.19 Pedestrian Clearance 2

4.3.1.20 Pedestrian Recall

4.3.1.21 Pedestrian Recycle

4.3.1.21.1 Pedestrian Recycle allows a late start or restart of pedestrian service after start of vehicle green if there is sufficient max green or split time remaining to completely serve the walk and pedestrian clearance.

4.3.1.21.2 By default this shall be enabled.

4.3.1.22 Dual Entry

4.3.1.23 Walk Rest

4.3.1.24 Simultaneous Gap

4.3.1.25 Red Rest

4.3.1.26 Advanced Walk

4.3.1.27 Delay Walk

4.3.1.28 Last Car Passage

4.3.1.29 Phase recycle

4.3.1.29.1 The software shall allow vehicle and pedestrian phases to be re-serviced in the cycle if enough time remains to provide a minimum service.

4.3.1.29.2 The user shall be able to enable phase re-service by phase and by coordination pattern.

4.3.1.29.3 The user shall define the second of the local cycle a re-service may occur and the second of the local cycle a re-service must be finished.

4.3.1.29.4 Vehicular phases shall be re-serviced, even if the pedestrian phase cannot be re-served that cycle.

4.3.1.29.5 This feature shall allow the user to operate part of the coordinated cycle in free mode.

4.4 PHASE TIMING PARAMETERS

4.4.1 The software shall provide the following timing parameter ranges:

Parameter	Range (Seconds)	Increments (Seconds)
Min Green 1	1-255	1
Min Green 2	1-255	1
Passage Time	0-25.5	0.1
Max Green 1	1-255	1
Max Green 2	1-255	1
Max Green 3	1-255	1
Conditional Service Max	1-255	1
Detector Disable	0-25.5	0.1
Yellow Clearance	0-25.5	0.1
All-Red Clearance	0-25.5	0.1
Walk 1	0-255	1
Walk 2	0-255	1
Pedestrian Clearance 1	0-255	1
Pedestrian Clearance 2	0-255	1
Advanced Walk	0-25.5	0.1
Delay Walk	0-25.5	0.1
Added Initial	0-25.5	0.1
Time to Reduce	1-255	1
Time Before Reduction	1-255	1
Minimum Gap	0-25.5	0.1
Variable Left Turn Time	0-25.5	0.1
Last Car Passage	0-25.5	0.1
Walk 2 Enable Time	0-255	1
Pedestrian Clearance 2 Enable Time	0-255	1

4.4.2 The software shall provide the following phase timing parameters.

4.4.2.1 Minimum Green 1

4.4.2.1.1 Minimum green 1 is the default value unless the users specifies minimum green 2 in the active phase parameters table

4.4.2.1.2 The software shall not violate a minimum green 1 unless there is a request for priority or preemption.

4.4.2.2 Minimum Green 2

4.4.2.2.1 The software shall not violate a minimum green 2 unless there is a request for priority or preemption.

4.4.2.3 Vehicle Extension

4.4.2.3.1 This is the base extension value. Any value in the detector configuration table is added to this amount.

4.4.2.4 Maximum Green 1

4.4.2.4.1 Maximum green 1 shall be the default value if no other Maximum value is entered.

4.4.2.5 Maximum Green 2

4.4.2.6 Maximum Green 3

4.4.2.7 Conditional Service Max

4.4.2.7.1 The maximum green time provided on a phase when timing due to conditional service.

4.4.2.7.2 If the Conditional Service Max is 0 seconds, this max timer shall have no effect. The active maximum green timer shall apply.

4.4.2.7.3 This max green shall apply to the second time the phase is served in a cycle. The active maximum green timer shall apply to the first time the phase is served in a cycle.

4.4.2.8 Yellow Clearance

4.4.2.8.1 The user defined yellow shall not be less than 3.0 seconds. If the user enters a yellow less than 3.0 seconds the software will output 3.0 seconds unless the minimum yellow time is disabled.

4.4.2.8.2 The software shall not output a yellow interval shorter than the user defined value.

4.4.2.8.3 The software shall not display a yellow interval 0.01 seconds longer than the user defined value.

4.4.2.9 All-Red Clearance

4.4.2.10 Walk 1

4.4.2.10.1 The software shall be capable of truncating the walk if there is a request for priority or preemption.

4.4.2.10.2 The software shall not output a walk interval shorter than the user defined value with the exception of a preemption event.

4.4.2.11 Walk 2

4.4.2.11.1 The software shall be capable of truncating the walk if there is a request for priority or preemption.

4.4.2.11.2 The software shall not output a walk interval shorter than the user defined value with the exception of a preemption event.

4.4.2.12 Pedestrian Clearance 1

4.4.2.12.1 The software shall be capable of truncating the pedestrian clearance interval if there is a request for priority or preemption.

4.4.2.12.2 The software shall not output a pedestrian clearance interval shorter than the user defined value with the exception of a priority or preemption event.

4.4.2.12.3 The pedestrian clearance shall time with an overlap's green clearance and shall not extend the duration of the overlap green clearance interval.

4.4.2.12.4 The software shall be capable of outputting the value of the clearance interval to the countdown timer. It shall be assumed the countdown timer is not learning the duration of the pedestrian clearance; the software is providing this value.

4.4.2.13 Pedestrian Clearance 2

4.4.2.13.1 The software shall be capable of truncating the pedestrian clearance interval if there is a request for priority or preemption.

4.4.2.13.2 The software shall not output a pedestrian clearance interval shorter than the user defined value with the exception of a priority or preemption event.

4.4.2.13.3 The pedestrian clearance shall time with an overlap's green clearance and shall not extend the duration of the overlap green clearance interval.

4.4.2.13.4 The software shall be capable of outputting the value of the clearance interval to the countdown timer. It shall be assumed the countdown timer is not learning the duration of the pedestrian clearance; the software is providing this value.

4.4.2.14 Advance Walk

4.4.2.14.1 Entering a value in a cell in the table will activate this feature.

4.4.2.14.2 The software shall not output an advanced walk if the output is from a pedestrian overlap and the pedestrian interval is active before the beginning of the phase.

4.4.2.14.3 The software shall begin the pedestrian phase during the vehicle green even if advanced walk is programmed provided ample phase green time is remaining on the compatible vehicle phases.

4.4.2.15 Delay Walk

4.4.2.15.1 The software shall not output a delayed walk unless the pedestrian phase is called before the vehicle phase begins.

4.4.2.15.2 The software shall not output a delayed walk if the output is from a pedestrian overlap and the pedestrian interval is active before the beginning of the phase.

4.4.2.15.3 The software shall begin the pedestrian phase during the vehicle green if the delayed walk is programmed. The delayed walk shall not be provided if the pedestrian phase is called and served during the vehicle green.

4.4.2.16 Volume Density – Added Initial

4.4.2.16.1 The software shall activate this feature when the user defines the added initial and maximum initial green for a phase.

4.4.2.17 Added Initial

4.4.2.18 Maximum Initial Green

4.4.2.19 Volume Density – Vehicle Extension

4.4.2.19.1 The software shall activate this feature when the user defines the minimum vehicle extension, maximum vehicle extension, time before reduction, and time to reduce for a phase.

4.4.2.20 Minimum Vehicle Extension

4.4.2.21 Maximum Vehicle Extension

4.4.2.22 Time Before Reduction

4.4.2.23 Time To Reduce

4.4.2.24 Walk 2

4.4.2.24.1 If the pedestrian movement is an overlap, the software shall call the walk 2 defined in the overlap table.

4.4.2.24.2 If this parameter is 0 seconds, thenWalk 1shall be output.

4.4.2.25 Walk 2 Enable Time

4.4.2.26 Pedestrian Clearance 2

4.4.2.26.1 If the pedestrian movement is an overlap, the software shall call the pedestrian clearance 2 defined in the overlap table.

4.4.2.26.2 If this parameter is 0 seconds, the pedestrian clearance shall be output.

4.4.2.27 Pedestrian Clearance 2 Enable Time

4.4.2.28 Variable Left Turn Time

4.4.2.29 Last Car Passage

4.5 GLOBAL PHASE PARAMETERS

If a phase is put on recall or walk rest in the Global Phase Parameters table, the phase shall be on that recall or walk rest regardless of the active plan set table. The phases on recall or walk rest in the global phase parameters table shall be combined with the phases on recall or walk rest in the plan set tables. All recalls and walk rests programmed in the active plan set table shall apply regardless of the programming in the Global Phase Parameters table; the Global Phase Parameters table shall not prevent these recalls and walk rests from applying.

4.5.1 The Global Phase Parameters shall always be active.

4.5.2 The user shall be able to define the following phase parameters:

4.5.2.1 Global Minimum Recall

4.5.2.1.1 The Global Minimum Recall shall apply to all plan set tables.

4.5.2.1.2 These recalls shall be applied in addition to existing minimum recalls in the plan set table.

4.5.2.2 Global Maximum Recall

4.5.2.2.1 The Global Maximum Recall shall apply to all plan set tables.

4.5.2.2.2 These recalls shall be applied in addition to existing minimum recalls in the plan set table.

4.5.2.3 Global Pedestrian Recall

4.5.2.3.1 The Global Minimum Recall shall apply to all plan set tables.

4.5.2.3.2 These recalls shall be applied in addition to existing minimum recalls in the plan set table.

4.5.2.3.3 One pedestrian service shall be provided per cycle; this recall shall not cause the pedestrian service to recycle.

4.5.2.4 Global Walk Rest

4.5.2.4.1 The Global Walk Rest shall apply to all plan set tables.

4.5.2.4.2 These walk rest phases shall be applied in addition to the existing walk rest phases in the plan set table.

4.6 PEDESTRIAN OPERATION

4.6.1 The user shall be able to assign the pedestrian movement to any pedestrian channel.

4.6.2 The user shall be able to associate the pedestrian channel to one phase or associate the pedestrian channel with many phases.

4.6.3 When a pedestrian call is received, the software shall place a call for all of the pedestrian movements associated with that phase. The call for a pedestrian movement shall remain until the walk light is displayed.

4.6.3.1 If the pedestrian movement is an overlap, a walk light displayed for that pedestrian movement will remove the call no matter which phase was active when the walk was output.

4.6.3.2 If the walk light is currently being displayed, the pedestrian call shall be ignored.

4.6.3.3 If the pedestrian clearance is currently being displayed, the pedestrian call shall not be ignored.

4.6.4 The software shall provide an alternative pedestrian interval when a condition, programmed using the software's logic functions, is met.

4.6.4.1 The software must provide an alternative pedestrian walk interval when the push button is depressed for a user defined amount of time in seconds.

4.6.5 The software shall immediately begin clearing the active pedestrian phase if a preemption input is received.

4.6.5.1 This shall not apply if a request for partial priority is received.

4.6.6 The software shall allow for an exclusive pedestrian service phase.

4.6.7 The software shall be capable of outputting a Walk Rest for any pedestrian phase.

4.6.7.1 Walk Rest shall not delay the end of the compatible vehicle phase green.

4.6.8 The software shall allow for a pedestrian Barnes' Dance interval.

4.6.8.1 All pedestrian movements will display a walk and all vehicle displays will remain red.

4.6.8.2 Pedestrians may be allowed to cross diagonally.

4.6.9 The software shall allow the user to define the number of times a pedestrian interval will be served for each pedestrian call.

4.6.9.1 The user defined number of times will also serve as the maximum number of pending pedestrian calls. Additional pedestrian calls shall not exceed this maximum.

4.6.9.2 The user shall be able to define this for each pedestrian movement.

4.7 LEFT TURN OPERATION

4.7.1 The software shall allow the user to vary the mode of left turn operation by time of day/day of week.

4.7.2 The software shall allow the user to vary the mode of left turn operation within a timing plan.

4.7.3 The software shall be capable of operating a flashing yellow arrow left turn display or a flashing red arrow left turn display in protected only, protected/permitted, and permitted only modes as defined in the Texas Manual of Uniform Traffic Control Devices.

4.7.4 The software shall be capable of operating a five section left turn.

4.7.4.1 The software shall be capable of operating a Dallas Left Turn display. The software shall provide the following modes of left turn operation.

4.7.4.1.1 Permitted Only

4.7.4.1.2 Protected/Permitted

4.7.4.1.3 Protected Only

4.8 RIGHT TURN OPERATION

4.8.1 The software shall allow the user to vary the mode of right turn operation by time of day/day of week.

4.8.2 The software shall allow the user to vary the mode of right turn operation within a timing plan.

4.8.3 The software shall be capable of operating a flashing yellow arrow right turn display or a flashing red arrow right turn display in protected only, protected/permitted, and permitted only mode as defined in the Texas Manual of Uniform Traffic Control Devices.

4.8.4 The software shall be capable of providing a green arrow for a right turn movement unless the parallel pedestrian movement is called. If the parallel pedestrian movement is active, the controller will output a flashing yellow arrow to the right turn display during the pedestrian interval. After the pedestrian interval is finished timing, the software shall provide a green arrow for the right turn movement as long as the green arrow can be displayed for at least the active minimum green for the overlap.

4.8.4.1 If the pedestrian phase will be serviced while the controller is outputting a green arrow to the right turn display, the controller will immediately end the green arrow by outputting a solid yellow arrow, and then a flashing yellow arrow. The pedestrian walk shall not output until the right turn overlap has finished clearing.

4.8.4.2 Right Turn Red Indication.

4.8.4.2.1 By default a steady red indication shall not be displayed if the green arrow is clearing for a pedestrian movement (green arrow, solid yellow arrow, flashing yellow arrow).

- The software shall be capable of displaying the red indication during the pedestrian interval if the user chooses.

4.8.4.2.2 If the all-red is omitted, the flashing yellow arrow and walk indication shall begin simultaneously immediately after the solid yellow indication.

4.8.4.2.3 The user shall be able to enable the all-red duration interval defined in the phase parameter table.

4.8.4.2.4 The user shall be able to enable displaying the red arrow during the pedestrian interval for a user defined amount of time in seconds.

- This shall be distinct from the all-red clearance for that right turn.

4.9 PEDESTRIAN HYBRID BEACON OPERATION

4.9.1 The software shall allow for full operation of a Pedestrian Hybrid Beacon as described in the 2009 MUTCD, Chapter 4F.

4.9.2 The software shall operate the three-head vehicle indications (two red circular indications set horizontally over one yellow circular indication) and standard pedestrian heads.

4.9.3 The sequence for the Pedestrian Hybrid Beacon shall be as follows:

4.9.3.1 All vehicle heads shall remain dark until the pedestrian activates the pedestrian push button. Pedestrian heads shall display a solid Don't Walk during times when the vehicle heads are not illuminated.

4.9.3.2 Vehicle heads shall flash yellow upon activation of the pedestrian push button. Pedestrian heads shall display solid Don't Walk indications.

4.9.3.3 Vehicle heads shall display a steady yellow indication. Pedestrian heads shall display solid Don't Walk indications. The will serve as the yellow clearance interval.

4.9.3.4 Vehicle heads shall display a steady red indication in both red heads in the three-head display. Pedestrian indications shall display a solid Don't Walk indication. This will serve as the all-red interval.

4.9.3.5 Vehicle heads shall display a steady red indication in both red heads in the three-head display. Pedestrian indications shall display a Walk indication. This will serve as the pedestrian walk interval.

4.9.3.6 Vehicle heads shall display alternating flashing red indications for the two red heads in the three-head display. Pedestrian indications shall display a Flashing Don't Walk indication. This will serve as the pedestrian clearance interval.

4.9.3.7 Following pedestrian clearance interval, the vehicular heads will all go dark in the absence of any pedestrian service calls. The cycle will start over at the next pedestrian service request.

4.9.4 The software shall operate the Pedestrian Hybrid Beacon in coordination with adjacent traffic signals. The user shall be able to define the period in the local cycle when the Pedestrian Hybrid Beacon may activate.

4.10 PHASE SEQUENCE

4.10.1 General

4.10.1.1 The user shall select the order of the phases.

4.10.1.2 The user shall be able to change the order of the phases without making changes to the ring/barrier structure programmed.

4.10.1.3 The phase sequence defined in the active plan set shall not override other special functions.

4.10.2 Pre-Signal Sequence

4.10.2.1 The software shall be able to output the following sequence:

4.10.2.1.1 Green

4.10.2.1.2 Yellow clearance

4.10.2.1.3 All-red clearance

4.10.2.1.4 Red flash – The software shall output a red flash while the channel is not active.

4.10.2.1.5 Solid red

- Once the pre-signal changes to solid red it shall remain solid red until the pre-signal turns green; it cannot revert to flashing red.

4.10.2.2 The pre-signal shall change to solid red after

4.10.2.2.1 A user defined after of time

4.10.2.2.2 A queue detector is active

4.10.2.3 The user shall be able to activate this sequence by time of day/day of week.

5 OVERLAPS

5.1 GENERAL

5.1.1 The software shall support a minimum of 20 total overlaps.

5.1.1.1 Each of the 20 overlaps can be programmed as either a vehicle overlap or pedestrian overlap.

5.1.2 The software shall provide a user definable text label for each overlap. The text label shall be a minimum of 18 characters.

5.1.3 The software shall provide templates the following types of overlaps:

5.1.3.1 NTCIP normal

5.1.3.2 Dallas phasing left turn

5.1.3.3 3-Section flashing yellow arrow permissive left turn

5.1.3.4 4-Section flashing yellow arrow protective/permissive left turn

5.1.3.5 Arlington phasing left turn

5.1.3.6 3-Section flashing red arrow permissive left turn

5.1.3.7 4-Section flashing red arrow protective/permissive left turn

5.1.3.8 Right turn overlap

5.1.3.9 4-Section flashing yellow arrow protective/permissive right turn

5.1.3.10 Pedestrian overlap

5.1.3.11 Pre-signal overlap

5.1.4 The software shall allow the user to program a minimum of eight (8) overlap tables.

5.1.4.1 A call to a pedestrian overlap shall place a call on all parent phases associated with the pedestrian overlap.

5.2 OVERLAP CONFIGURATION

5.2.1 The software shall provide the following overlap configuration settings for each of the 20 overlaps:

5.2.1.1 Overlap identifier

5.2.1.1.1 Identifies which overlap (1-20) is being programmed

5.2.1.2 Enable

5.2.1.3 Overlap type

5.2.1.4 Omit

5.2.1.5 Pedestrian

5.2.1.5.1 Identifies this overlap has a pedestrian movement associated with it

5.2.1.6 Pedestrian Overlap Walk 1

5.2.1.7 Pedestrian Overlap Walk 2

5.2.1.8 Pedestrian Overlap Clearance 1

5.2.1.9 Pedestrian Overlap Clearance 2

5.2.1.10 Primary Parent Phases

5.2.1.11 Negative Parent Phases

5.2.1.11.1 Negative Parent Phases are phases that the overlap is not allowed to time a concurrent green indication with. A negative phase will not cause an active overlap to turn red.

5.2.1.12 Inhibit Negative Vehicle Phases

5.2.1.13 Negative Pedestrian Phases (see operational scenario 5.4.1)

5.2.1.13.1 These pedestrian phases, when active, shall prevent the overlap from displaying a green. A pedestrian phase will be prevented from changing to walk while the overlap is active.

5.2.1.13.2 This feature will cause the programmed overlap to immediately begin yellow clearance if the controller is going to immediately serve the pedestrian phase.

5.2.1.13.3 The controller shall not output a walk for the pedestrian phase until the programmed overlap is no longer active.

5.2.1.13.4 The negative pedestrian phase will not cause an active pedestrian phase to end.

5.2.1.14 Negative Overlaps

5.2.1.14.1 Overlap the programmed overlap is NOT allowed to time with.

5.2.1.15 Green Omit

5.2.1.16 Overlap Suppression Phases

5.2.1.16.1 These vehicle phases, when green, will prevent the output of the overlap green. The overlap will output green once the phase turns yellow.

5.2.1.16.2 This feature will cause an active overlap to immediately begin clearing.

5.2.1.17 Yellow Flash

5.2.1.17.1 Programs the overlap to flash yellow, instead of flashing red, during programmed flash operation and startup flash operation.

5.2.1.18 Flash-Red During Inactive

5.2.1.18.1 Enables the functionality described in 5.4.2.1.1 below.

5.2.1.19 Alternate Hertz Flash

5.2.1.19.1 Causes overlaps to flash on the alternate half cycle from other phases and overlaps not configured for alternate flash hertz during programmed and start up flash operation.

5.3 OVERLAP TIMING PARAMETERS

5.3.1 Minimum Green

5.3.1.1 The overlap shall not terminate while this interval is timing.

5.3.1.2 If this parameter is 0 seconds, the active minimum green for the active compatible phase shall apply.

5.3.2 Green Extension

5.3.2.1 Maximum length of time the overlap can be extended.

5.3.3 Green Clear

5.3.3.1 Amount of time the overlap will remain green after the last parent phase starts to terminate.

5.3.4 Yellow Clearance

5.3.4.1 The yellow clearance shall be 0.0 seconds through 25.5 seconds.

5.3.4.2 The yellow clearance programmed in the overlap table shall override the yellow clearance programmed in the phase parameters table.

5.3.4.3 The software shall not output a yellow interval shorter than the user defined value.

5.3.4.4 The software shall not display a yellow interval 0.1 seconds longer than the user defined value.

5.3.5 Red Clearance

5.3.5.1 The all-red clearance shall be 0.0 seconds through 25.5 seconds.

5.3.5.2 The all-red clearance programmed in the overlap table shall override the all-red clearance programmed in the phase parameters table.

5.3.5.3 The software shall not output an all-red interval shorter than the user defined value.

5.3.5.4 The software shall not output an all-red interval 0.1 seconds longer than the user defined value.

5.3.6 Pedestrian Overlap Walk 1

5.3.6.1 Length of time the walk indication will be displayed for the overlap.

5.3.6.2 The software shall be capable of truncating the walk if there is a request for priority or preemption.

5.3.6.3 The walk programmed in the overlap table shall override the walk programmed in the phase parameter table.

5.3.7 Pedestrian Overlap Walk 2

5.3.7.1 Length of time the walk indication will be displayed for the overlap.

5.3.7.2 The software shall be capable of truncating the walk if there is a request for priority or preemption.

5.3.7.3 The walk programmed in the overlap table shall override the walk programmed in the phase parameter table.

5.3.8 Pedestrian Clearance 1

5.3.8.1 Length of time the pedestrian clearance will be displayed for the overlap.

5.3.8.2 The software shall be capable of truncating the pedestrian clearance interval if there is a request for priority or preemption.

5.3.8.3 The pedestrian clearance programmed in the overlap table shall override the pedestrian clearance programmed in the phase parameter table.

5.3.8.4 The software shall turn the input on and then off every one-half second for the duration of the clearance interval.

5.3.8.5 The pedestrian clearance shall time with the compatible overlap's green clearance.

5.3.8.6 The pedestrian clearance shall not increase the length of an overlap's green clearance. If there is not enough time for the pedestrian interval, the software shall delay the ending of the parent phase.

5.3.9 Pedestrian Clearance 2

5.3.9.1 Length of time the pedestrian clearance will be displayed for the overlap.

5.3.9.2 The software shall be capable of truncating the pedestrian clearance interval if there is a request for priority or preemption.

5.3.9.3 The pedestrian clearance programmed in the overlap table shall override the pedestrian clearance programmed in the phase parameter table.

5.3.9.4 The software shall turn the input on and then off every one-half second for the duration of the clearance interval.

5.3.9.5 The pedestrian clearance shall time with the compatible overlap's green clearance.

5.3.9.6 The pedestrian clearance shall not increase the length of an overlap's green clearance. If there is not enough time for the pedestrian interval, the software shall delay the ending of the parent phase.

5.3.10 Reservice

5.3.10.1 Minimum amount of red time that the overlap must display before it can restart.

5.4 OVERLAP OPERATIONS

5.4.1 Right turn arrow overlap with pedestrian service

5.4.1.1 When a right turn overlap is in conflict with a pedestrian phase or overlap, there shall be two possible programmable actions that can occur:

5.4.1.1.1 If a pedestrian call is received while the right turn overlap is active, the user may select to have the right turn overlap immediately terminate IF there is adequate time remaining to clear the overlap and then immediately serve the pedestrian within the parent phase time remaining without causing transition.

5.4.1.1.2 If a pedestrian call is received while the right turn overlap is active, the user may select to have the right turn continue for its programmed time and the pedestrian will be served during its next available parent's programmed time.

5.4.2 Pre-Signal Overlap

5.4.2.1 The software shall provide the following functionality for pre-signal overlap operation:

5.4.2.1.1 The overlap shall be capable of outputting a solid green, solid yellow, solid red, flashing red, solid red sequence. Green, yellow and all-red will output when the parent phases are active; flashing red and solid red will output when the parent phases are not active.

5.4.2.1.2 While parent phases are not active, the user shall be able to define the number of seconds the red indications flash before going to solid red, or shall be controlled by a queue detector input.

5.4.2.1.3 Once the solid red is displayed the pre-signal shall display solid red until the next green.

5.4.3 Pedestrian Overlaps

5.4.3.1 The pedestrian interval shall time with the parent phases listed in the active overlap table. Once a pedestrian movement is programmed as an overlap, the pedestrian walk and clearance values in the overlap table shall be output.

5.4.3.2 If the Walk 2 Enable Time or Pedestrian Clearance 2 Enable Time is satisfied, the Walk 2 and Pedestrian Clearance 2 programmed in the overlap table shall be output.

5.4.3.3 The available time for the pedestrian service shall be from the beginning of the first parent phase to the end of the last parent phase.

5.4.3.4 The pedestrian shall be serviced if a call is received while any parent phase is active and there is enough time to clear conflicting overlaps and serve the pedestrian before the end of the last parent phase.

5.4.3.5 The last parent phase will not be allowed to terminate until the pedestrian clearance interval has finished. Other parent phases shall be allowed to end early.

5.4.3.6 The software shall be capable of outputting a walk rest for any pedestrian overlap.

5.4.3.6.1 The user shall be able to select walk rest for the pedestrian overlap.

5.4.3.6.2 This feature will ensure the walk rest time and pedestrian clearance time fit within the parent phase times.

5.4.3.6.3 When in walk rest, the ped overlap shall run concurrently with all vehicle parent phases without the user having to explicitly identify walk with each parent phase.

5.4.3.7 The software shall allow the Walk 2 interval to be programmed for each overlap.

5.4.3.7.1 The software must provide an alternative pedestrian interval when the push button is depressed for an extended period of time. The user will define the number of seconds required to activate the alternative Pedestrian.

6 SCHEDULE

6.1 GENERAL

6.1.1 The software shall provide the following four schedule types:

6.1.1.1 Time of Day/Day of Week

6.1.1.2 Holiday

6.1.1.3 Seasonal

6.1.1.4 Temporary

6.1.2 The software shall automatically sort the schedule chronologically by the time of day entry.

6.1.3 The software shall allow the enabling or disabling of any event in the schedule.

6.1.4 Each scheduled event shall completely define the current operation. Scheduled events shall not be cumulative.

6.1.5 All schedule events shall be logged.

6.1.6 The schedule types shall be prioritized as follows (highest to lowest):

6.1.6.1 Holiday – overrides all other schedule types.

6.1.6.2 Temporary – overrides seasonal and active Time of Day/Day of Week schedule.

6.1.6.3 Seasonal – Overrides active Time of Day/Day of Week schedule.

6.1.6.4 Active Time of Day/Day of Week.

6.2 TIME OF DAY/DAY OF WEEK SCHEDULE (TOD/DOW)

6.2.1 The software shall support at least 32 events in each schedule that can be activated by Time of Day/Day of Week.

6.2.2 The Software shall support a minimum of 16 Time of Day/Day of Week Schedules.

6.2.3 The schedule shall allow the user to schedule, as a minimum, any of the following operational modes:

- Plan Set
- Yellow Flash
- All-red Flash
- Free

6.2.4 Each Time of Day/Day of Week Schedule shall include the following user defined parameters:

6.2.4.1 Enable/disable event

6.2.4.2 Event start time

6.2.4.2.1 The time of day will be in military time.

6.2.4.2.2 The user shall be able to define the hour and minute of the event.

6.2.4.3 Day of Week

6.2.4.4 Action (i.e. Plan Set, flash, free)

6.2.4.5 Description of schedule event

6.2.4.5.1 The field will allow 48 characters for descriptive message.

6.3 HOLIDAY SCHEDULE

6.3.1 The software shall support fixed and floating holidays.

6.3.2 The user shall be able to schedule holiday events at least one year in advance.

6.3.3 The user shall be able to define a minimum of five (5) days on either side of the holiday as part of the holiday event.

6.3.4 The user shall be able to sort the holiday schedule by month and day

6.3.5 The holiday schedule shall provide the following user defined parameters:

6.3.5.1 Enable/disable event

6.3.5.2 Fixed holiday date

6.3.5.3 Number of days prior holiday

6.3.5.4 Number of days after holiday

6.3.5.5 Required Action (i.e. activate new TOD Schedule)

6.3.5.6 Floating holiday month

6.3.5.7 Floating holiday week

6.3.5.8 Floating holiday day

6.3.5.9 Description of schedule event

6.3.5.9.1 This field will allow a minimum of 48 characters for a descriptive message

6.4 SEASONAL SCHEDULE

The seasonal schedule shall allow the user to disable certain events in the Time of Day/Day of Week schedule. During the summer, when school is not in session, the City will use this feature to disable the events in the schedule that call the signal timing plans for school.

6.4.1 The software shall allow the scheduling of a minimum of 10 seasonal events. These events shall activate a different Time of Day/Day of Week schedule based on the current time of the year.

6.4.2 The user shall be able to schedule seasonal events for the entire year and at least one year in advance.

6.4.3 The seasonal schedule shall provide the following user defined parameters

6.4.3.1 Enable/disable event

6.4.3.2 Start month of seasonal schedule

6.4.3.3 Start day of seasonal schedule

6.4.3.4 End month of seasonal schedule

6.4.3.5 End day of seasonal schedule

6.4.3.6 Required Action (i.e. activate new TOD Schedule)

6.4.3.7 Description of schedule event

6.4.3.7.1 This field will allow a minimum of 48 characters

6.5 TEMPORARY SCHEDULE

6.5.1 The user shall be able to schedule events that will expire after a user defined time period.

6.5.1.1 This feature shall be off by default.

6.5.2 Upon completion of the time period, the software shall revert back to the default schedule and alarm the user the time period has expired.

6.5.2.1 The user shall select if the software will revert back to the default schedule. By default the software shall revert back to the default schedule.

6.5.2.2 The user shall select if the software will alarm the user. By default the software shall alarm the user.

6.5.2.3 The user shall be able to extend the amount of time the temporary schedule runs. After the extension the requirements for reverting back and alarming the user listed above shall apply.

6.5.3 The software shall support a minimum of four (4) temporary schedule events. These events shall activate a different Time of Day/Day of Week schedule.

6.5.4 The user shall be able to schedule any of the following operational modes:

6.5.4.1 Plan Set

6.5.4.2 Free

6.5.4.3 Yellow Flash

6.5.4.4 All-red Flash

6.5.5 Upon completion of the last time period, the user shall be able to choose if the temporary schedule shall be deleted.

6.5.5.1 The software shall prompt the user.

6.5.6 The temporary schedule shall provide the following user defined parameters:

6.5.6.1 Start day of temporary schedule

6.5.6.2 Start Time of temporary schedule

6.5.6.3 End Day of temporary schedule

6.5.6.4 End Time of temporary schedule

6.5.6.5 Required action (i.e. activate new TOD schedule)

6.5.6.6 Description of temporary schedule

6.5.6.6.1 This field will contain a minimum of 48 characters.

7 COORDINATION

7.1 GENERAL

7.1.1 Software shall provide a minimum of 32 locally stored timing plan sets.

7.1.1.1 The user shall be able to label each timing plan; each text label shall be at least six characters in length.

7.1.2 The software shall not activate the coordinator on start-up until the start-up vehicle and pedestrian phases programmed by the user have been serviced.

7.1.3 Upon entry of any phase parameter, special function, internal clock update, coordination change, or other adjustment the coordinator shall automatically recognize the change and activate at the beginning of the next cycle.

7.1.4 The controller shall read the coordination parameters, special function, detector settings, and overlap changes at the same time. Detection and overlap programming changes shall occur at the beginning of the new timing plan.

7.1.5 The offset reference point shall be user selectable,

7.1.5.1 The user shall be able to select any of the following reference points:

7.1.5.1.1 Beginning of yellow of the coordinated phases

7.1.5.1.2 Beginning of green of the coordinated phases

7.1.5.1.3 End of all-red clearance of the coordinated phases

7.1.5.2 The default offset reference point shall be the beginning of yellow for the coordinated phases.

7.2 COORDINATION PARAMETERS

7.2.1 The user shall be able to enter the following coordination parameters.

7.2.1.1 Cycle Length

7.2.1.1.1 If the cycle length is 0 seconds, the software shall run free while that plan is called by the daily schedule or a manual command. If a split is entered for any phase, the value entered by the user shall be the active maximum green time for that phase. If the split is zero (0) seconds, the active maximum green shall apply.

7.2.1.2 Phase Splits

7.2.1.2.1 Nominal phase split – split time active when controller is not in transition.

7.2.1.2.2 Minimum phase split – minimum split time allowed when controller is transitioning.

7.2.1.2.3 Maximum phase split – maximum split time allowed when the controller is transitioning.

7.2.1.2.4 Global percent adjustment – global feature to be used in place of minimum and maximum split times that will allow all active phases to be adjusted by the user defined percentage during transition.

7.2.1.3 Offset Reference Point

7.2.1.4 Offset

7.2.1.4.1 Offset value is entered in seconds.

7.2.1.5 Coordinated Phases – user identified coordinated phases

7.2.1.6 Inhibit Maximum

7.2.1.7 Transition Type

7.2.1.7.1 The user shall enter the preferred transition mode and number of cycles to transition.

7.2.1.7.2 Transition mode options shall include: short way, long way, dwell and auto. Auto option shall be the controller calculated quickest way to return to coordinated operation whether it is short way or long way.

7.2.1.7.3 The controller shall adjust faster than the programmed number of cycles if an adjustment less than the maximum is required.

7.2.1.7.4 The software shall proportionally reduce or increase each split during transition within the minimum and maximum values set for phases if the user has defined these.

7.2.1.7.5 The transition time shall be proportionally distributed to all phases.

7.3 PEDESTRIAN SERVICE

7.3.1 Pedestrian phases shall be serviced without entering free mode even if the pedestrian walk and clearance interval is longer than the vehicle phase split. When the pedestrian phase is longer, the software shall provide three options: (1) steal time from the preceding phase, (2) steal time from the subsequent phase, or (3) the local cycle will pause. The software shall allow the user to use all three options at once to accommodate a pedestrian phase.

7.3.1.1 The software shall allow the user to define the amount of time in seconds stolen from the preceding phase.

7.3.1.2 The software shall allow the user to define the amount of time in seconds stolen from the subsequent phase.

7.3.1.3 If pedestrian adjust is enabled, the local cycle shall pause at the end of the phase associated with the pedestrian movement for the additional amount of time needed to finish the pedestrian clearance.

7.3.1.4 If pedestrian adjust is not enabled, the additional amount of time needed to serve the pedestrian phase shall be stolen from the subsequent phases. The time shall be in addition to the user defined value.

7.3.1.4.1 The pedestrian phase shall not be omitted during normal operation. A pedestrian call shall not cause the coordinated timing plan to fail.

7.3.1.5 If the extra time is required to serve the pedestrian phase, the amount of time stolen from other phases shall be evenly split between the preceding and subsequent phases unless the user did not enter a high enough number in the stolen phase parameters.

7.3.1.5.1 If the user did not enter enough time and pedestrian adjust is enabled, the local cycle shall pause. If pedestrian adjust is not enabled the time shall be stolen from the subsequent phases.

7.3.2 Pedestrian Adjust

7.3.2.1 The user shall be able to enable this feature that will pause the local cycle until the pedestrian interval has finished if the pedestrian movement is still active after the programmed force off for the compatible vehicle phase. The software shall immediately begin transition by shortening the phases remaining in that cycle.

7.3.2.2 When enabled, the local cycle shall pause for the amount of time needed to serve the pedestrian movement less the time stolen from the preceding phase and the subsequent phase.

7.3.3 If the pedestrian phase ends the preceding phase early, the concurrent vehicle phase shall begin early with the pedestrian phase.

7.3.4 If the pedestrian phase is not requested until the clearance interval of the preceding phase, the pedestrian phase will still begin with the concurrent vehicle phase.

7.3.5 If the pedestrian phase requires more time than the compatible vehicle phase, the call for the pedestrian phase must be received before the beginning of the concurrent vehicle phase; otherwise, the pedestrian phase shall not be served during that green.

7.3.6 If the pedestrian phase called requires less time than the compatible vehicle phase that is currently green and will not delay the end of the phase, the pedestrian phase, when called, shall be requested immediately and serviced as soon as any conflicting outputs have finished clearing.

7.4 PEDESTRIAN SERVICE PARAMETERS

7.4.1 Enable pedestrian adjust

7.4.2 Time stolen from preceding phase

7.4.2.1 This value shall be zero by default.

7.4.2.2 Entering a non-zero value shall activate this feature.

7.4.3 Time stolen from the subsequent phase

7.4.3.1 This value shall be zero by default.

7.4.3.2 Entering a non-zero value shall activate this feature.

7.5 COORDINATED OPERATIONS (USE CASES)

7.5.1 Recycle left turn – software shall recycle the leading left turn phase if all of the following conditions are met:

7.5.1.1 The oncoming through phase has received its full minimum green time,

7.5.1.2 There is time to provide a minimum service to the left turn before the end of the permitted period, and

7.5.1.3 There is a vehicle call for that left turn phase.

7.5.1.4 This will provide a second left turn service if more vehicles arrive within the permitted period after the initial leading left turn service has ended. The user shall select if this feature is enabled.

7.5.2 Backup into the leading left turn

7.5.2.1 If there is no call for the leading left turn, the software shall skip the left turn phase and serve the oncoming through traffic.

7.5.2.2 If a call for the skipped left turn is received prior to the end of the permitted period, the software shall serve the skipped left turn phase as long as the oncoming through movement has received its full minimum green time.

7.5.2.3 The user shall select if this feature is enabled.

7.5.3 Optional leading left turn – software shall provide a leading left turn phase if all of the following conditions are met:

7.5.3.1 The minor street returns to the main street early,

7.5.3.2 There is enough time remaining in the side street split to provide a full minimum service for the main street left turn phase, and

7.5.3.3 There is a call for the main street left turn.

7.5.3.4 The user shall select if this feature is enabled.

7.5.4 Double serve side streets – when the side street returns early to the main street, the software shall allow the minor street phases to recycle if all of the following conditions are met:

7.5.4.1 The main street has received its full minimum service,

7.5.4.2 There is enough time remaining in the permitted period for the minor street to serve a full minimum vehicular service, and

7.5.4.3 There is a call for the minor street phase.

7.5.4.4 The software shall operate fully actuated during the permitted period for the minor street and shall only serve the minor street or main street through phases.

7.5.4.5 The main street leading left turn shall not be permitted until the minor street phase omit has been applied because the permitted window is about to close.

7.5.4.6 The user shall select if this feature is enabled.

7.5.5 Free mode operation within the coordinated cycle

7.5.5.1 While operating in coordinated mode, the software shall provide the option to operate a portion of the cycle in free mode.

7.5.5.2 The user shall be able to define two (2) free mode periods within one (1) cycle.

7.5.5.3 The user shall select the beginning of the free mode operation, the end of the free mode operation and the phases that may be active.

7.5.5.4 At the end of the free mode period, the active phases shall force off if they are not the first coordinated phases.

7.5.6 Optional lagging left turn

7.5.6.1 The software shall allow the user to provide a lagging left turn if the active extension time for the oncoming through is 0.0 seconds.

7.5.6.2 The user shall enter the number of seconds the oncoming through phase may end early.

7.5.6.3 The lagging left turn shall end the same second of the local cycle that the oncoming through would have ended.

7.5.6.4 The user shall select if this feature is enabled.

7.5.7 Phase recycle with split phase

7.5.7.1 When a minor street is split phased, the software shall allow the user to recycle the minor street phases before returning to the main street phases as long as there are calls for the side street phases and there is enough time to provide a minimum split for the phase.

7.5.7.2 Once there are no longer any calls on the minor street, the user may choose to hold in the minor street or return to the main street phases.

7.5.7.3 Once the permitted window for the minor street has ended, the controller shall return to the main street phases.

7.5.7.4 The software shall be capable of providing this operation during two distinct periods each cycle.

7.5.8 Optional service with split phase

7.5.8.1 When a minor street is split phase and the software is programmed to serve only one minor street phase before returning to the main street, the software shall allow the user to serve the other minor street phase before returning to the main street as long as there is a call and there is enough time to provide a minimum split for the phase.

7.5.8.2 The software shall be capable of providing this operation during two distinct periods each cycle.

8 PREEMPTION

8.1 GENERAL

8.1.1 The software shall provide a minimum of 12 unique programmable preemption sequences.

8.1.2 The software shall provide the following types of preemption:

8.1.2.1 Railroad

8.1.2.2 Emergency Vehicle

8.1.3 The user to shall be able to program any preemption sequence as a railroad or emergency vehicle type.

8.1.4 The user shall be able to label each unique preemption sequence.

8.1.4.1 Each label shall be at least eight (8) characters in length

8.1.5 The user shall be able to delay the preemption input.

8.1.6 The software shall be able to smoothly transition from one preemption table to another.

8.1.7 The user shall be able to input the preemption input into the logic functions and output the result.

8.1.8 The user shall be able to activate warning lights, blank out signs, and other auxiliary devices during a preemption sequence.

8.1.8.1 The user shall be able to turn on and off the devices using logic function outputs.

8.1.8.2 A minimum of eight (8) special outputs shall be provided.

8.1.8.3 The user shall be able to activate each special output at any time during the preemption event.

8.1.8.3.1 The user will be able to assign an internal logic pin to the special output and use the output in logic statements.

8.1.8.3.2 The user will be able to assign an external logic pin to the special output to activate field equipment while the special pin is active.

8.1.8.3.3 The user shall be able to activate an auxiliary field device transition table.

8.1.9 The software shall automatically reset the maximum duration timer if the preempt input goes off and then comes back on during the dwell state.

8.1.10 The software shall not recycle the preempt entry phases. If phases defined as entry phases are green, they shall remain green

8.1.11 The software shall not recycle the return phases. If the return phases are green, they shall remain green.

8.1.12 The active coordinated timing plan shall continue to run in the background during the preemption event. The coordinated timing plan shall have no effect on the signal operation while the preemption is active.

8.1.13 The user shall be able to change the mode of operation for any traffic signal display when a preemption input is received. This function will allow the user to change selected overlaps to red at any time during the preemption event.

8.1.14 The software shall provide multiple preemption exit options. The user shall be able to select the exit routine for each preemption sequence. The exit options shall include:

8.1.14.1 The user shall be able to place calls on selected phases upon exiting preemption.

8.1.14.2 Queue Delay Recovery - The software shall support a return to the phase with demand the longest wait time. The user shall be able to set the priority level for each phase.

8.1.14.3 First Phase Skipped - The software shall support a return to the first phase skipped. A skipped phase shall also include a phase that received a minimum green immediately preceding the preempt.

8.1.14.3.1 If the phase received more than the minimum time it will not be considered the first phase skipped.

8.1.14.4 Exit to Coordination/Normal Operation - The software shall support an immediate return to the place in the coordinated cycle where the software would have been had there been no preempt.

8.1.14.4.1 Once the preemption input turns off, the software shall hold in the active phases until the software has read the applicable coordination parameters and checked the inputs from the detectors.

8.1.14.4.2 The software shall not recycle the clearance phases. If the clearance phase should be active, those phases shall remain green.

8.1.14.4.3 After the preemption the overlaps will begin following the parent phases again and shall turn green if their parent phase is green.

8.1.14.5 Exit to Alternate Maximum Times - The software shall support return to alternate maximum times for each vehicle phase if the software is operating in free mode.

8.1.14.5.1 The user shall be able to designate the duration in minutes (0 to 60) for how long to operate the alternate maximum times. The software shall return to normal operation at the top of the cycle following the exit to alternate maximum time being exceeded.

8.2 PREEMPT STATES

8.2.1 The software shall report the status of the preemption sequence using the following states:

8.2.1.1 The preemption sequence is not active.

8.2.1.2 The minimum presence timer is active.

8.2.1.3 The preempt service delay timer is active.

8.2.1.4 The preempt service is timing the Entry 1 phases.

8.2.1.5 The preempt service is timing the Entry 2 phases.

8.2.1.6 The preempt service is timing the Dwell phases.

8.2.1.7 The preempt service is timing the exit phases.

8.2.1.8 The preempt service maximum duration timer has expired.

8.3 PREEMPTION PRIORITY

8.3.1 The software shall automatically assign a high or low priority level to each enabled preemption event based on the preemption type.

8.3.2 For each preemption type, the user shall be able to assign an equal or lower priority to each preemption event.

8.3.3 The software shall automatically assign the high priority level to any preemption event enabled as a railroad type.

8.3.3.1 All railroad preemption events shall have equal priority.

8.3.4 The software shall not allow an emergency vehicle preempt event to be programmed with a higher priority than a railroad preempt.

8.3.5 The software shall automatically assign the low priority level to any preemption event enabled as an emergency vehicle type.

8.3.5.1 By default, all emergency vehicle preemption events shall have equal priority.

8.3.5.2 The user shall be able to program up to four (4) emergency vehicle preemption priority levels.

8.3.6 High priority preempts shall override low priority preempts.

8.3.6.1 A request for a high priority preemption event shall immediately cancel any active low priority preemption event and begin the high priority event.

8.3.7 Low priority preempts shall be ignored until the high priority preempt terminates.

8.3.7.1 The low priority event shall begin running in the background. Once the inputs for high priority event terminates the high priority event immediately end and the low priority event shall output its current state.

8.3.7.2 Any part of the high priority event that occurs after the high priority event input terminates shall be cancelled. The software shall immediately output the current state of the low priority preemption sequence.

8.3.8 Equal priority preempts shall be served on a first called, first served basis.

8.3.8.1 The second preemption sequence shall begin running in the background. Once the inputs for first preemption sequence turn off the first sequence shall immediately end and second preemption sequence shall output its current state.

8.3.8.2 Any part of the first preemption sequence that occurs after the first preemption input turns off will be cancelled. The software shall immediately output the second preemption sequence.

8.4 RAILROAD PREEMPTION

8.4.1 The software shall support the configuration of the following modes of Railroad preemption:

8.4.1.1 Normal

8.4.1.1.1 Normal preemption mode shall terminate all active vehicle and pedestrian phases and begin the clearance phases.

8.4.1.2 Smooth

8.4.1.2.1 Smooth preemption mode shall allow the user to define each step in the preemption sequence. During each step the user shall be able to define which vehicle and pedestrian phases are permitted, called and extended.

8.4.2 The software shall accept a minimum of four (4) unique inputs from the railroad.

8.4.3 Train preemption shall be provided when the software is running programmed all-red and yellow-red flash.When the preemption input is received, the software shall change the phases flashing yellow to steady green and then begin preemption.

8.4.4 The entry phase shall not terminate until the railroad gates are in the lowered/down position.

8.4.4.1 The entry phases shall terminate based on the following user defined options:

8.4.4.1.1 Gate active/down input from the railroad

8.4.4.1.2 Maximum clearance time input for the entry phases.

8.4.5 The user shall be able to program the intersection to operate in yellow or all-red flash during the Dwell phase interval.

8.5 EMERGENCY VEHICLE PREEMPTION

8.5.1 The software shall support the following types of emergency vehicle preemption systems:

8.5.1.1 Line-of-sight infrared

8.5.1.2 Global Positioning Satellite (GPS)

8.5.2 The software shall accept at least six (6) unique inputs from the Emergency Vehicle Preemption system.

8.5.2.1 The user shall be able to configure what inputs are received from the emergency vehicle preemption system.

8.5.2.2 The inputs shall include, at a minimum, the following:

8.5.2.2.1 Direction of travel

8.5.2.2.2 Desired route

8.5.2.2.3 Vehicle ID number

8.5.2.2.4 Estimated time of arrival

8.5.3 The software shall hold in the clearance phases and overlaps until the preemption input turns off or the maximum preemption time is exceeded.

8.5.3.1 Software shall provide a user enabled option (on or off) for software prevention of any occurrence of a yellow trap situation.

8.5.4 The software shall provide the current traffic demand to the emergency vehicle preemption system. The emergency vehicle preemption system will use this information to adapt when the preemption input is provided to the software based on current traffic conditions.

8.5.4.1 During low traffic volumes the preemption input shall be provided as the fire or rescue vehicle is arriving at the intersection.

8.6 NORMAL PREEMPT CONFIGURATION

Normal preemption shall activate when an advance signal has been active long enough to satisfy any delay programmed. Any minimum green, walk, and pedestrian clearance intervals defined in the normal preempt configuration table shall be met. The Entry 1 phases will turn green for the duration programmed, and then the Entry 2 phases will turn green for the duration programmed. Entry 1 or Entry 2 phases shall hold until the gate input is received and they delay end of entry phases time is satisfied. The dwell phases will begin and hold until the gate input turns off. The software shall follow the user defined exit mode and then return to normal operation.

8.6.1 The user shall be able to select the following minimum preemption options:

8.6.1.1 Enable

8.6.1.2 Preemption type (railroad or emergency vehicle)

8.6.1.3 Preempt lock

8.6.1.3.1 Preempt lock shall be on by default

8.6.1.3.2 Disabling preempt lock shall allow the preempt call to be cancelled prior to reaching the dwell phases.

8.6.1.4 Override Program Flash

8.6.1.4.1 By default, a preempt call shall override program flash

8.6.1.4.2 Enabling this option will cause the preempt call to not override program flash. The user shall be able to select this for railroad and/or emergency vehicle preemption.

8.6.1.5 Dwell Mode

8.6.1.5.1 The user shall be able to configure the way the preempt will operate during the dwell state.

8.6.1.5.2 The dwell mode shall include the following options:

- Normal – The configured dwell phases and overlaps shall operate normally during the dwell state.
- Flash – The intersection shall operate in flash during the dwell period.

8.6.1.6 Flash Yellow Dwell

8.6.1.6.1 User selected phases shall flash yellow during flash dwell. All other phases shall flash red.

8.6.1.6.2 User selected overlaps shall flash yellow during dwell mode. All other overlaps shall flash red.

8.6.1.7 Maximum Duration Time Exceeded Action

8.6.1.7.1 The user shall be able to program the action that the controller will implement when the maximum duration time is exceeded.

8.6.1.7.2 One maximum duration timer shall be provided for railroad.

8.6.1.7.3 One maximum duration timer shall be provided for emergency vehicles.

8.6.1.7.4 The user shall be able to program the following actions when the maximum duration time is exceeded:

- Terminate Preempt – The preempt will terminate and not reactivate until all preempt inputs have been cleared
- Flash – The intersection shall enter all-red flash operation until all preempt inputs have been cleared.

8.6.1.8 Return Phases

8.6.1.8.1 The return phases shall run following the end of preempt.

8.6.1.8.2 These phases shall output to the overlaps. If the phases are parents of any overlaps, the overlaps shall turn green.

8.6.1.8.3 The phases shall remain green for at least the minimum green defined in the active phase parameters table.

8.6.1.8.4 The phases shall remain green as long as there are detector inputs for green extensions or the maximum green timer defined in the active phase parameter table is reached.

8.6.1.8.5 If no return phases are defined, the software shall exit preempt via the exit mode entered.

8.6.1.9 Exit Mode

8.6.1.10 Entry 1 Phases (Railroad Preempt)

8.6.1.11 Entry 2 Phases (Railroad Preempt)

8.6.1.11.1 Entry 2 phases shall be served immediately after Entry 1 Phases.

8.6.1.12 Vehicle Dwell Phases

8.6.1.13 Pedestrian Dwell – Walk Rest phases

8.6.1.13.1 These phases shall remain in walk during the dwell interval of the preemption.

8.6.1.13.2 Pedestrian clearance shall begin immediately after the preemption is complete.

8.6.1.14 Pedestrian Dwell – Call phases

8.6.1.14.1 These phases shall receive one pedestrian call during the dwell interval of the preemption.

8.6.1.14.2 If it has not already begun, the pedestrian clearance shall begin immediately after the preemption is complete.

8.6.1.15 Entry 1 Overlap Disable

8.6.1.15.1 Overlaps identified here will be omitted during the Entry 1 interval.

8.6.1.16 Entry 2 Overlap Disable

8.6.1.16.1 Overlaps identified here will be omitted during the Entry 2 interval.

8.6.1.17 Dwell Overlap Disable

8.6.1.17.1 Overlap identified here will be omitted during the Dwell interval.

8.6.1.17.2 The overlaps listed in Entry 2 and Dwell Overlap Disable shall remain red when the software changes from Entry 2 to Dwell.

8.6.1.18 Dwell Yellow Overlap Flash

8.6.1.18.1 Overlaps identified here will flash yellow if the software is in flash operation during the dwell interval.

8.6.2 The user shall be able to enter values for the following preemption timing parameters:

8.6.2.1 Minimum Presence Time

8.6.2.1.1 The minimum presence time is the minimum time that a preemption call shall be present/on prior to initiating a preempt event.

8.6.2.1.2 The range for the minimum presence time shall be from 0.0 to10.0 seconds in one-tenth (1/10) second increments

8.6.2.2 Delay Time

8.6.2.2.1 The software shall delay the initiation of the preemption event by the delay time.

8.6.2.2.2 The delay and minimum pedestrian clearance shall time simultaneously.

8.6.2.2.3 Even if the delay time has passed, the preemption sequence shall not begin until the minimum pedestrian clearance time has also passed.

8.6.2.2.4 The range shall be from 0 to 255 seconds in one (1) second increments.

8.6.2.3 Delay End of Last Entry Phase

8.6.2.3.1 The value in the amount of time that the last Entry phase will hold green after the gate input is received.

8.6.2.3.2 A value of zero (0) seconds will terminate the last Entry Phase immediately.

8.6.2.3.3 The range for the delay end of last entry phase shall be from 0 to 255 seconds in one (1) second increments.

8.6.2.4 Minimum Duration Time

8.6.2.4.1 This value is the minimum time that the preempt time will be active.

8.6.2.4.2 The range for the minimum duration time shall be from 0 to 600 seconds in one (1) second increments

8.6.2.5 Maximum Duration Time

8.6.2.5.1 The value is the maximum time that the preempt input will be considered valid.

8.6.2.5.2 The user shall be able to program what action will be taken if the maximum duration time is exceeded.

8.6.2.5.3 An alarm shall be generated that includes the preemption inputs, the logical names for those inputs, and a time stamp.

8.6.2.5.4 The range for the maximum duration time shall be from 0 to 600 seconds in one (1) second increments.

8.6.2.6 Minimum Start Green

8.6.2.6.1 This value is the minimum amount of time that any active phase must be green before it can be terminated by a preempt input.

8.6.2.6.2 A value of zero (0) will terminate the active phase immediately. The default value shall be zero (0) seconds.

8.6.2.6.3 The software shall serve the lesser of the minimum start green or the minimum green in the active phase parameter table.

8.6.2.6.4 The range for the minimum start green shall be from 0 to 255 seconds in one (1) second increments

8.6.2.7 Minimum Pedestrian Walk

8.6.2.7.1 This value is the minimum amount of time that any active pedestrian walk must serve prior to being terminated by a preempt input.

8.6.2.7.2 A value of zero (0) will terminate the active pedestrian phase immediately. The default value shall be zero (0) seconds.

8.6.2.7.3 The software shall serve the lesser of the minimum pedestrian walk or the pedestrian walk time in the active phase parameter table.

8.6.2.7.4 The range for the maximum duration time shall be from 0 to 255 seconds in one (1) second increments

8.6.2.8 Minimum Pedestrian Clearance

8.6.2.8.1 This value is the minimum amount of time that any active pedestrian clearance must serve prior to being terminated by a preempt input.

8.6.2.8.2 A value of zero (0) will terminate the active pedestrian phase immediately. The default value shall be zero (0) seconds.

8.6.2.8.3 The software shall serve the lesser of the minimum pedestrian clearance or the pedestrian clearance time in the active phase parameter table.

8.6.2.8.4 The range for the maximum duration time shall be from 0 to 255 seconds in one (1) second increments

8.6.2.9 Entry 1 Green

8.6.2.9.1 This value is the amount of time that the Entry 1 phases will remain green.

8.6.2.9.2 A value of zero will omit the Entry 1 phase

8.6.2.9.3 The Entry 1 Green shall only be terminated early by a valid Gate Down input from the railroad.

8.6.2.9.4 The Entry 1 Green shall override the value for minimum and maximum times in the active phase parameter table.

8.6.2.9.5 The range for the Entry 1 green time shall be from 0.0 to 255 seconds in one (1) second increments

8.6.2.10 Entry 2 Green

8.6.2.10.1 This value is the amount of time that the Entry 2 phases will remain green.

8.6.2.10.2 A value of zero will omit the Entry 2 phase

8.6.2.10.3 The Entry 2 Green shall only be terminated early by a valid Gate Down input from the railroad.

8.6.2.10.4 The Entry 2 Green shall override the value for minimum and maximum times in the active phase parameter table.

8.6.2.10.5 The range for the Entry 2 green time shall be from 0.0 to 255 seconds in one (1) second increments

8.6.2.11 Minimum Dwell Time

8.6.2.11.1 This value is the minimum amount of time that the dwell interval will serve.

8.6.2.11.2 The Minimum Dwell time shall not terminate prior to the completion of the minimum duration time.

8.6.2.11.3 The range for the minimum dwell time shall be from 0 to 255 seconds in one (1) second increments.

9 TRANSIT PRIORITY

9.1 GENERAL

9.1.1 The software shall operate the transit signal displays

9.1.1.1 The bar signal sequence shall be:

9.1.1.1.1 Steady Vertical Bar (Go Indication)

9.1.1.1.2 Flashing Vertical Bar (Yellow Clearance)

9.1.1.1.3 Steady Horizontal Bar (Stop Indication)

9.1.1.1.4 Flashing Horizontal Bar (Prepare to Go Indication)

9.1.1.2 The user shall be able to define the amount of time, in seconds, the bar indications display each of the displays in the sequence.

9.1.1.3 The vertical and horizontal bar shall flash one time per second. The bars shall be on for one-half second then off for one-half second.

9.1.1.4 The user shall define the duration of the all-red interval. Other phases shall be prevented from turning green while the all-red interval is active.

9.1.1.5 The train bar signals shall operate independently by direction and shall operate such that only the direction with an approaching train shall be activated.

9.1.1.6 The bar signal sequence shall be built into the software. Using logic parameters to output the train bar signal as described shall not meet this requirement.

9.1.2 The user shall be able to define the following transit signal parameters

9.1.2.1 Yellow Clearance – This is the duration, in seconds, of the flashing vertical bar.

9.1.2.2 All-Red – This is the duration, in seconds, the steady horizontal bar shall be displayed before any conflicting phase may turn green.

9.1.2.3 Prepare To Go – This is the duration, in seconds, of the flashing horizontal bar.

9.1.3 The software shall be able to synchronize the end of the all-red for the train bar signal and the end of the all-red for the vehicle and pedestrian phase.

9.1.4 The software shall provide a minimum of three (3) levels of priority, in the following order of precedence. Preemption requests shall override all priority requests.

9.1.4.1 Full priority operation

9.1.4.2 Partial priority operation

9.1.4.3 Bus priority operation

9.1.4.4 The hierarchy of priority is full priority is the highest, followed by partial priority and bus priority as lowest priority.

9.1.5 High priority services shall override low priority services.

9.1.5.1 A request for a high priority service event shall immediately cancel any active low priority service event and begin the high priority event.

9.1.6 Low priority services shall be ignored until the high priority service terminates.

9.1.6.1 The low priority event shall begin running in the background. Once the inputs for high priority event terminates, the high priority event will immediately end and the low priority event shall output its current state.

9.1.6.2 Any part of the high priority event that occurs after the high priority event input terminates shall be cancelled. The software shall immediately output the low priority event.

9.1.7 Equal priority services shall be served on a first called, first served basis.

9.1.7.1 The second priority sequence shall begin running in the background. Once the inputs for first priority sequence turn off the first sequence shall immediately end and second priority sequence shall output its current state.

9.1.7.2 Any part of the first priority sequence that occurs after the first priority input turns off will be cancelled. The software shall immediately output the second priority sequence.

9.2 FULL PRIORITY OPERATION

The software shall utilize the functionality required in the emergency vehicle, normal or smooth preemption section to provide full priority. The coordinated cycle will be interrupted when a full priority input is received and can be served.

Full priority operation shall fulfill the vision in the Memorandum of Understanding for the Transit Signal Priority System Operation and Maintenance along the Downtown Dallas Transitway mall. The software shall also provide the functionality documented in the logical diagrams for the full priority section in the appendix.

9.2.1 Full transit priority shall be provided for median running trains when the controller is operating in free, flashing and coordinated modes.

9.2.2 The software shall be capable of providing an exclusive train phase.

9.2.2.1 The user shall be able to select vehicle and pedestrian movements that are compatible with the train and may be served simultaneously.

9.2.3 Full transit priority shall be provided when the software is running programmed yellow and all-red flash.

9.2.3.1 When a request for transit service is received, the controller shall terminate the flash operation and return to normal operation. The software shall provide service for the train phase, and any compatible phases. The software shall then return to flash operation.

9.2.4 In the event that the full priority operation is terminated by the timeout parameter, the following sequence of events will occur.

9.2.4.1 The software will provide service to all other vehicular and pedestrian movements with calls at the intersection.

9.2.4.1.1 The user shall select the phases and pedestrian movements served and the amount of time these phases shall remain green.

9.2.4.2 The software will restart the timeout timer.

9.2.4.3 The software will return to the full priority mode.

9.2.4.4 An event will be logged that includes the input was on too long, the logical name for the input, and a timestamp.

9.2.5 The software shall log events and include the following information:

9.2.5.1 Time the check in was received.

9.2.5.2 Time the check-out was received.

9.2.5.3 Time the downstream track was not clear.

9.2.5.4 Time the downstream track was clear.

9.3 PARTIAL TRANSIT PRIORITY

The software shall provide early green and extended green by direction for a train. The additional green will be used to give the train operator a better chance to make it through the signal. The software shall continue to operate in coordination.

Partial priority operation shall fulfill the vision in the Memorandum of Understanding for the Transit Signal Priority System Operation and Maintenance along the Downtown Dallas Transitway Mall. The software shall also provide the functionality documented in the logical diagrams for the partial priority section in the appendix.

9.3.1 General

9.3.1.1 The software shall allow the user to define four full sets of partial priority parameters, one for each direction.

9.3.1.2 A request for early green and green extension shall be priority requests and shall not be canceled by other equal or lower priority requests.

9.3.1.3 The software shall stay in coordination with adjacent intersections while adjusting the splits to accommodate the train. When the train is not present, the extra green time shall be provided to movements on the intersecting roadway.

9.3.1.4 Train indications and all compatible vehicle and pedestrian indications shall end their clearance intervals concurrently.

9.3.1.5 The software shall hold the train phase based on the length of the train. The software shall allow the user to define different green durations based on the length of the train.

9.3.1.6 The software shall be capable of holding a train at the signal until the downstream track to the next holding block and the next holding block are both clear.

9.3.1.6.1 The software shall be able to consider two and three car trains separately. The software shall release the train when the downstream block long enough to hold that length of train is clear. These will be different blocks because of the train length.

9.3.1.6.2 The software shall be able to process detector inputs from downstream intersections and use build in or programmable logic to determine if the next downstream block long enough to hold the train is not occupied.

9.3.1.7 The software shall log events and include the following information:

9.3.1.7.1 Time the check in was received, by direction.

9.3.1.7.2 Time the check-out was received by direction.

9.3.1.7.3 Time downstream was not clear.

9.3.1.7.4 Time downstream was clear.

9.3.1.7.5 Time green extension was provided.

9.3.1.8 If the train crosses the check-out detector, the clearance interval shall begin immediately.

9.3.1.8.1 The train phase shall be able to gap out and begin clearance immediately. Other active phases shall not prevent the train phase from beginning the clearance interval.

9.3.1.8.2 Compatible vehicle and pedestrian phases shall operate as follows.

9.3.1.8.3 The pedestrian phase shall begin clearing, if it has not already done so, when the train phase gaps out.

9.3.2 Partial Priority Configuration

9.3.2.1 Compatible Phases

9.3.2.1.1 User identified vehicle and pedestrian phases compatible the train signal. They shall be active while the train signal is active.

9.3.2.2 Check In Detectors

9.3.2.2.1 These are the detectors that call the train phase. The call and extension shall remain active for that transit phase until the train is checked out from the intersection.

9.3.2.3 Check Out Detectors

9.3.2.3.1 These are the detectors that end the call for the train phase. The train phase call and extension shall immediately end once an input is received from one of these detectors.

9.3.2.3.2 Transit phase shall begin clearing immediately regardless of the state of any other active phases.

9.3.2.3.3 If the checkout detector is active for a user defined number of seconds, a new call for partial priority shall be entered because the train is still present. The train shall checkout once that detector turns off.

9.3.2.4 Delay Timer

9.3.2.4.1 This is the amount of time in second the detector will have to be active before the software acknowledges it is active.

9.3.2.4.2 The default value shall be zero (0).

9.3.3 Partial Priority Timing Parameters

9.3.3.1 The software shall provide a minimum of three tables with the following timing parameters that can be selected to be operational by time of day and day of week.

9.3.3.2 Minimum Green – the minimum amount of time, in seconds, the vertical bar signal shall be displayed.

9.3.3.3 Maximum Green – the maximum amount of time, in seconds, the vertical bar signal shall be displayed.

9.3.3.4 Green Extension

9.3.3.4.1 User defined amount of time, in seconds, that the green interval can be extended beyond its maximum or split time to accommodate the transit priority request.

9.3.3.4.2 The user shall be able to enable green extension by direction.

9.3.3.4.3 The green extension shall not reduce the amount of time for the next movement to the extent that the minimum green time cannot be served or the pedestrian interval cannot be served.

9.3.3.4.4 The user may choose to allow a pedestrian movement to be skipped to accommodate a green extension.

9.3.3.5 Early Green

9.3.3.5.1 User defined amount of time in seconds that the software may begin a train-compatible phase early to accommodate the priority request. The early green shall reduce the green time for the preceding phases.

9.3.3.5.2 The user shall be able to enable early green by direction.

9.3.3.5.3 The early green shall not reduce the amount of time for the preceding movement such that the minimum green time or pedestrian interval cannot be provided. Walk time shall not be truncated to meet this requirement.

9.3.3.5.4 The user may choose to allow the pedestrian movement to be skipped to accommodate early green.

9.3.3.6 Maximum Priority Service Time

9.3.3.6.1 User defined time, in seconds, that priority can be active. When this value is exceeded, priority requests are cancelled and regular, programmed operation is resumed.

9.3.3.7 Lock Out Time

9.3.3.7.1 User defined time, in seconds, that priority requests are not acknowledged due to maximum time in priority operation. When this time has passed, priority requests will be acknowledged, and priority operation will resume.

9.3.3.8 Countdown Timer Time

9.3.3.8.1 The user shall enter the time, in seconds, the countdown timer will start before the beginning of the transit phase for that direction.

9.3.4 Partial Priority Operation

9.3.4.1 The software shall automatically select whether early green or green extension is provided. The software will decide based on the active phase when the train priority request is received and the anticipated arrival time of the train.

9.3.4.1.1 The user shall be able to turn early green and green extension off by direction and by time of day/day of week.

9.3.4.2 The software shall be able to vary the amount of green provided to the train based on the length of the train. The detection system will provide a distinct input for each length of train.

9.3.4.2.1 The duration of the green shall vary without disrupting the active coordinated timing plan.

9.3.4.3 The software shall be able to determine if the track ahead of the train is clear by using detector inputs from adjacent intersections.

9.3.4.4 The train shall not be allowed to enter a block if any downstream block between the train and the next block long enough to hold that train is not clear. The bar signal for that direction shall remain red until the track is clear and the local cycle is at the time when that train phase is served.

9.3.4.4.1 This feature shall prevent trains from stopping in blocks that are shorter than the train and blocking intersections.

9.3.4.4.2 This feature shall consider the length of the train in the decision process.

9.3.4.5 The software shall provide a countdown timer output. The countdown timer will display the amount of time remaining until the next go indication will be displayed.

9.3.4.5.1 The software shall be able to accommodate a 50 second countdown.

9.3.4.5.2 The countdown timer shall begin a user defined amount of time in seconds before the go signal and provide a constant output during the downtown interval.

9.3.4.5.3 The software shall only output the countdown timer information if a train is detected at the immediate intersection.

9.3.4.5.4 The end of the countdown shall coincide with the beginning of the transit phase.

9.3.4.5.5 The software shall be capable of providing the value of the countdown to the timer. The format of this value shall be accepted by at least two (2) off-the-shelf countdown timer vendors.

9.3.4.6 The software shall deny a train priority request and not provide a go signal under the following conditions:

9.3.4.6.1 The track between the train and the next block long enough to hold the train is not clear. This includes the block long enough to hold the train. The train will have to stop in a block that is too short and will block an intersection.

9.3.4.6.2 The maximum vehicle queue length on the cross street has been exceeded.

9.3.4.7 The user shall define the mode of operation if peer to peer communication is lost to any intersection or detection device defined by the user. The mode of operation shall automatically return to normal operation once communication is restored.

9.3.4.7.1 The user shall program the controller to automatically adjust the operation of the traffic light when communication is lost. User defined options shall includealways providing priority, adding recalls and changing plans. The user shall be able to vary the response by time of day.

9.3.4.7.2 An alarm will be generated that includes the communication link that failed and the time of that failure.

9.3.4.7.3 The user shall be able to select the criterion that indicates a communication failure including the amount of time in seconds a link is down, the number of times a link is down over an amount of time, and other criteria standard to the communications industry.

9.3.4.8 The user shall define the mode of operation if detection has failed at the intersection. The software shall determine failure using the functionality for the vehicle detectors. The user shall be able to select the detectors to monitor. The mode of operation shall automatically return to normal operation once the failed detector is restored.

9.3.4.8.1 The user shall program the controller to automatically adjust the operation of the traffic light when detection fails. User defined options shall include always providing priority, adding recalls and changing plans. The user shall be able to vary the response by time of day.

9.3.4.8.2 An alarm will be generated that includes the detector that failed and the time of that failure.

9.3.4.8.3 The software shall use the criterion already defined for the detectors to determine failure.

9.4 BUS PRIORITY

The software shall provide early green, extended green and queue jump by direction for a bus if the bus is on a route selected by the City and DART and the bus is behind schedule. The additional green will be used to give the bus a better chance to make it through the traffic signal. The software shall continue to operate the intersection in coordination.

9.4.1 General

9.4.1.1 The software shall provide a minimum of three (3) tables with the following timing parameters that can be selected to be operational by time of day and day of week.

9.4.1.2 The software shall receive an input from separate bus priority equipment. The software will provide the appropriate priority sequence based on the input from the bus priority equipment or other selected inputs. The three responses are:

9.4.1.2.1 Early green

9.4.1.2.2 Green extension

9.4.1.2.3 Queue Jump

9.4.1.3 The software shall allow the user to define six (6) full sets of partial priority parameters, one for each direction. These shall be unique from the train priority inputs.

9.4.1.4 The bus priority computer shall provide unique inputs for each direction the bus may approach the intersection.

9.4.1.4.1 Two separate bus priorities shall be accommodated: early or extended green and queue jump.

9.4.1.5 The software shall ignore a bus priority request if the software is operating the traffic light in programmed yellow flash or all-red flash.

9.4.1.6 The software shall automatically select whether early green or green extension is provided. The software will decide based on which phases are active when the bus priority input is received.

9.4.1.6.1 The software shall continue to provide priority at the next opportunity in the local cycle as long as the bus priority input is active.

9.4.1.7 The software shall log the following data related to bus priority:

9.4.1.7.1 Type of priority request, by direction with time stamp.

9.4.1.7.2 Time priority phases initiated.

9.4.1.7.3 Time priority phases ended.

9.4.1.7.4 Action taken:

- Direction receiving early green
- Direction receiving extended green
- Direction receiving queue jump
- Extend a phase
- Truncate a phase
- Queue jump

9.4.2 Bus Priority Configuration

9.4.2.1 Bus priority phases

9.4.2.1.1 These are the phases that will output a green indication during the bus priority interval.

9.4.2.1.2 These phases shall remain green until:

- The priority request input has terminated.
- The maximum priority time has been reached.

9.4.2.2 Bus priority overlaps

9.4.2.2.1 These are the overlaps that will output a green indication during the bus priority interval.

9.4.2.3 Queue jump phases

9.4.2.3.1 User identified phases that will output a green indication during the queue jump interval.

9.4.2.4 Queue jump overlaps

9.4.2.4.1 These are the overlaps that will output a green indication during the queue jump interval

9.4.2.5 Bus priority detection input

9.4.2.5.1 Detector associated with the priority request for early green or green extension.

9.4.2.6 Queue jump detection input

9.4.2.6.1 Detector associated with the queue jump request.

9.4.2.7 Delay Time

9.4.2.7.1 The amount of time in seconds the bus priority input must be on before the software will acknowledge the priority request.

9.4.3 Bus Priority Timing

9.4.3.1 Green Extension

9.4.3.1.1 The amount of time, in seconds, that the software may extend the green indication for the bus phase past the normal phase maximum or split time.This extension will reduce the green time for the following movement served if running in coordinated operation.

9.4.3.1.2 The green extension shall not reduce the amount of time for the following movements such that the minimum green time cannot be provided or the pedestrian interval cannot be provided.

- The pedestrian interval shall only limit the green extension if a call for the pedestrian phase is active in the controller.

9.4.3.1.3 The user may choose to allow the pedestrian movement to be skipped.

9.4.3.2 Early Green

9.4.3.2.1 The amount of time, in seconds, that the software may begin the compatible green phase early to serve the bus. The early green shall reduce the green time for the preceding phases.

9.4.3.2.2 The early green shall not reduce the amount of time for the preceding movement such that the minimum green time or pedestrian interval cannot be provided.

9.4.3.2.3 The user may choose to allow the pedestrian movement to be skipped.

9.4.3.2.4 The walk or pedestrian clearance shall not be truncated to meet this requirement.

9.4.3.3 Maximum Priority Time

9.4.3.3.1 This is the maximum amount of time in minutes the bus priority call may remain active.

9.4.3.3.2 The software shall ignore the bus priority input once the maximum time has been exceeded until the bus priority input changes states.

9.4.4 Bus Priority Operation

9.4.4.1 Queue Jump

9.4.4.1.1 This is a green indication provided for the bus before the adjacent vehicles receive a green indication. The interval allows a bus to cross the intersection and merge into the through lane without having to yield to other vehicles.

9.4.4.1.2 If the queue jump lane is an exclusive right turn lane, the software shall be capable of displaying a right turn arrow to clear motorist ahead of the bus.

9.4.4.1.3 The controller shall only provide a queue jump before the adjacent through movement. If the bus arrives during the green and a request for a queue jump is received it shall be ignored until the time immediately before the beginning of green for the adjacent through movement.

- If early green time is programmed, the software shall steal time from the preceding phase and start the queue jump phase early.

9.4.4.1.4 The user shall be able turn this feature off by time of day/day of week.

9.4.4.1.5 Once the bus has requested a queue jump, the software shall not provide green extension for that direction.

10 ADVANCED PROGRAMMING

10.1 GENERAL

10.1.1 The software shall support a minimum of 64 user definable logic processor commands

10.1.2 The software shall not limit the number of items that can be linked together in logic statements.

10.1.2.1 The software shall process the logic commands linked together every 0.1 seconds.

10.1.3 The logic commands shall support the following Boolean gating:

10.1.3.1 OR – if either function is true, the logic channel will be true.

10.1.3.2 AND – if both functions are true, the logic channel will be true.

10.1.3.3 NOT- if the first function is NOT true, the logic channel will be true the second function is not used for this command.

10.1.3.4 XOR- if either function is true the channel is true; if both are true the channel will be false.

10.1.3.5 NOR – If either function is true, the logic channel will be false.

10.1.3.6 NAND – if both functions are true, the logic channel will be false.

10.1.3.7 ORNOT2 – if the first function is true OR the second function is not true, the logic channel will be true.

10.1.3.8 ANDNOT2 – if the first function is true AND the second function is not true, the logic channel will be true.

10.1.4 The logic commands shall support the following:

10.1.4.1 LATCH – once the first function is true, the logic channel will be true until the second function is true.

10.1.4.2 DELAY AND/OR EXTEND – once the function is true, the logic channel shall not be true until an amount of time in seconds defined by the user has elapsed. After the function changes from true to false, the logic channel shall remain true until an amount of time in tenths of seconds, seconds, minutes, or hours defined by the user has elapsed.

10.1.4.2.1 The range of the delay time shall be from 0 to 25.5 tenths of seconds, 0 to 255 seconds, or 0 to 255 minutes, 0 to 255 hours and defined separately.

10.1.4.2.2 The range of the extend time shall be from 0 to 25.5 tenths of seconds, 0 to 255 seconds, or 0 to 255 minutes, 0 to 255 hours and defined separately.

10.2 ASSIGNABLE OUTPUTS

10.2.1 The software shall provide the ability to program the following outputs in logic statements:

10.2.1.1 Phase green

10.2.1.2 Phase yellow

10.2.1.3 Phase red

10.2.1.4 Phase omit

10.2.1.5 Overlap green

10.2.1.6 Overlap yellow

10.2.1.7 Overlap red

10.2.1.8 Walk

10.2.1.9 Pedestrian clear

10.2.1.10 Don't walk

10.2.1.11 Overlap walk

10.2.1.12 Overlap pedestrian clear

10.2.1.13 Overlap don't walk

10.2.1.14 Phase on

10.2.1.15 Phase next

10.2.1.16 Phase check

10.2.1.17 Phase hold

10.2.1.18 Virtual phase green

10.2.1.19 Virtual phase yellow

10.2.1.20 Virtual phase red
10.2.1.21 LRV green
10.2.1.22 LRV yellow
10.2.1.23 LRV red
10.2.1.24 Force off
10.2.1.25 Preempt on
10.2.1.26 Preempt entry one
10.2.1.27 Preempt entry two
10.2.1.28 Preempt dwell
10.2.1.29 Preempt off
10.2.1.30 Flash
10.2.1.31 Free
10.2.1.32 Special Function
10.2.1.33 Active plan
10.2.1.34 Special output/time of day

10.3 ASSIGNABLE INPUTS

10.3.1 The software shall provide the ability include the following inputs in logic statements:

10.3.1.1 Vehicle detector
10.3.1.2 Pedestrian detector
10.3.1.3 Overlap detector
10.3.1.4 Overlap pedestrian detector
10.3.1.5 System detector
10.3.1.6 Queue detector
10.3.1.7 LRV detector
10.3.1.8 Terminate detector
10.3.1.9 Vehicle omit
10.3.1.10 Pedestrian omit
10.3.1.11 Overlap omit
10.3.1.12 Overlap pedestrian omit
10.3.1.13 LRV Omit
10.3.1.14 Phase hold
10.3.1.15 Overlap hold
10.3.1.16 Walk hold
10.3.1.17 Overlap walk hold
10.3.1.18 Preempt train input

10.3.1.19 Preempt emergency vehicle input
10.3.1.20 Flash sense
10.3.1.21 Manual control enable
10.3.1.22 Manual control advance
10.3.1.23 Stop time
10.3.1.24 Minimum recall
10.3.1.25 External start
10.3.1.26 Walk rest modifier
10.3.1.27 External coordination enable
10.3.1.28 Plan select enable
10.3.1.29 External time set
10.3.1.30 Door open
10.3.1.31 Force off
10.3.1.32 Red rest
10.3.1.33 Max inhibit
10.3.1.34 Max 2
10.3.1.35 Max 3
10.3.1.36 Pedestrian recycle
10.3.1.37 External plan select
10.3.1.38 Master sync input
10.3.1.39 Free select input
10.3.1.40 MMU flash
10.3.1.41 Local flash
10.3.1.42 Automatic flash
10.3.1.43 Gate down

11 COMMUNICATIONS

11.1 GENERAL

11.1.1 The software shall support the following types of external communications:

11.1.1.1 Controller to Central Supervisory Software

11.1.1.2 Masterless Peer-to-Peer between local controllers

11.1.1.3 Local Wireless Remote

11.1.2 The software shall be able to accommodate communication with all these communication types simultaneously.

11.1.3 The software shall support the following methods of communications:

11.1.3.1 The software shall support four independent FSK modems connections operating at speeds up to 9600 Baud

11.1.3.2 The software shall support two EAI/TIA232-E connections using a 9-pin connector for each connection.

11.1.3.3 The software shall support a minimum of two 10/100 Ethernet connections using standard RJ-45 connectors.

11.1.4 The software shall be able to communication either half or full duplex.

11.1.5 The local controller software shall transmit gratuitous ARP packets when first connected to an Ethernet Network

11.1.6 The local controller software shall be able to extract VLANS from a tagged trunk of VLANS being received from the Ethernet Network.

11.2 CENTER TO FIELD COMMUNICATION

11.2.1 The user shall be able to request a download or upload to the control system through the front panel.

11.2.1.1 The software shall display any pages that failed.

11.2.2 The local controller software shall support the following communication patterns:

11.2.2.1 Poll-Response

11.2.2.1.1 The software shall be capable of being polled every one (1) second.

11.2.2.2 Exception based reporting (controller initiated event driven communication).

11.2.3 The software shall support Central to Field (C2F) communications through the following hardware interfaces:

11.2.3.1 EIA/TIA 232-E compliant 9-pin connector

11.2.3.2 10/100 Ethernet RJ-45 connector

11.2.3.3 FSK Modem

11.2.4 The type of field to central communication shall be configurable by the user.

11.2.5 The software shall be capable of field to central communication over a 10/100 Ethernet network.

11.2.5.1 The local controller software shall include fully integrated, native support of the Ethernet protocol. Serial tunneling over an Ethernet network is not acceptable.

11.2.5.2 The local controller software shall support static IP and Dynamic Host Configuration (DHCP) IP address assignment.

11.2.5.3 The configuration of the local controller software communicating over an Ethernet network shall include the following settings:

11.2.5.3.1 Controller name

11.2.5.3.2 IP address

11.2.5.3.3 Subnet mask

11.2.5.3.4 Gateway address

11.2.5.3.5 Domain name server

11.2.5.3.6 DHCP enable

11.2.5.4 The local controller software shall support the ICMP Protocol stack to verify communication over an IP network.

11.2.5.5 The local controller software shall support Ethernet communications over interconnection methods including, but not limited to the following:

11.2.5.5.1 Point to point optical fiber

11.2.5.5.2 Shared multi-drop optical fiber

11.2.5.5.3 Serial strings of wireless point to point links

11.2.5.5.4 Point to multi-point wireless links

11.2.5.5.5 Wireless mesh

11.2.5.5.6 Long latency network

11.2.5.5.7 Varying latency network

11.2.5.5.8 DOCSIS modem, shared capacity technology

11.2.5.5.9 Ethernet over traffic cable

11.2.5.5.10 Ethernet over powerline

11.2.5.5.11 Ethernet over signal cable

11.2.5.5.12 Ethernet over 9-wire cable

11.2.5.5.13 Ethernet over coaxial cable

11.2.5.5.14 10BASE2 Ethernet over copper wire (twisted pair)

11.2.5.5.15 DSL and its extensions over copper wire

11.2.5.5.16 3G commercial wireless

11.2.5.5.17 4G WiMaxcommercial wireless

11.2.5.5.18 4G LTE commercial wireless

11.2.5.5.19 4G WiMaxprivate wireless

11.2.5.5.20 4G LTE private wireless

11.2.5.6 The local controller software shall support Network Time Protocol (NTP) for setting the controller clock.

11.2.5.7 The local controller software shall support File Transfer Protocol (FTP) for uploading and downloading files.

11.2.6 The local controller software shall be capable of field to central communication over a serial communication network.

11.2.6.1 The local controller software shall support EIA/TIA 232-E communications protocol standard in a serial communication network.

11.2.6.2 The local controller software shall support user definable speeds over a serial network up to 56 kbps.

11.3 PEER TO PEER COMMUNICATION

11.3.1 The local controller software shall support peer to peer communication between local intersection controllers exclusive of a central management system and along the most direct and reliable path allowable by the communication topology.

11.3.2 Peer to peer communication shall operate over an Ethernet network.

11.3.3 The local controller software shall support transmission and reception of multiple peer messages simultaneously.

11.3.4 The local controller software shall be able to transmit peer to peer messages to a minimum of five (5) intersections in all directions from the intersection transmitting the messages.

11.3.5 The local controller software shall be able to receive peer to peer messages from a minimum of five (5) intersections in all directions from the intersections receiving the message.

11.3.6 Peer intersections shall be selectable by the user.

11.3.6.1 Peer intersection will be identified by logical name

11.3.6.2 Peer intersection will be identified by IP address

11.3.6.3 The user shall be able to select any local controller input, output, or event to initiate a peer to peer message.

11.3.7 The receipt of a peer-to peer message shall cause the receiving intersection to apply an internal control on the receiving peer intersection.

11.3.7.1 The user shall be able to select any internal control event available in the software.

11.3.8 The local controller software shall have a user definable communication link timeout feature for each peer to peer message.

11.3.8.1 The timeout value shall range from 1 second to 60 seconds in one second increments.

11.3.8.2 The use shall be able to enable/disable the timeout feature.

11.3.8.3 Idle periods during which no peer to peer messages are being transmitted shall not cause the link to timeout.

11.3.9 The failure of a peer to peer communication link shall initiate a communication link failure alarm.

11.3.9.1 Failure of a communication link shall cause the receiving function to be set to a user defined fail state

11.3.9.2 When the communication keep-alive resumes, the variable set by a remote intersection shall return to its valid condition.

11.3.9.2.1 The user may override the defined fail state condition for each message.

11.4 LOCAL WIRELESS REMOTE

11.4.1 The user shall be able to access the local controller through a Local Wireless Remote Client using either of the following methods:

11.4.1.1 An adapter attached to the local controller

11.4.1.2 An 802.11 a/b/g/n Access Point installed in the intersection cabinet.

11.4.2 The local wireless remote client shall be available within a 200 foot radius of the controller cabinet.

11.4.3 The local wireless remote client connection shall use secure data communication transmissions and shall be available to approved users and equipment only.

11.4.4 Users shall be able to utilize the local wireless remote client from approved laptops, smartphones, touch screen tablets, or other remote devices.

11.4.5 The local wireless remote client shall support bandwidths at a minimum of a a/b/g/n data rate connection.

12 ADVANCED OPERATIONS

12.1 TRAFFIC RESPONSIVE OPERATION

If the Proposer has an adaptive solution the City desires a presentation of the functionality and a bid.

This requirement describes a decentralized traffic responsive operation. Traffic signals will be grouped together and a controller will be the master for the group. The other intersections will relay system detector information to the master controller via a peer-to-peer messaging; the master controller will determine the plan; and the master controller will command the other intersections in the group into the plan.

12.1.1 The software shall provide the following user defined and selectable parameters for traffic responsive operation:

12.1.1.1 Thresholds (1-10)

12.1.1.2 Activation threshold (density)

12.1.1.3 Traffic responsive detectors (1-32)

12.1.2 The software shall provide traffic responsive operation for a user defined intersection group

12.1.2.1 The software shall allow the selection of a single controller to serve as the traffic responsive master controller for the intersection group.

12.1.2.1.1 The master controller shall receive data from other controllers and transmit traffic responsive commands to the other controllers using the peer to peer communication links.

12.1.2.2 The software shall support at least 32 user selectable detectors from any intersection within the group for traffic responsive plan selection.

12.1.2.2.1 The software shall support weighting of the detector data by the user for each detector (K Value).

12.1.2.3 The software shall use algorithms developed by the US Department of Transportation for Traffic-Responsive Operation.

12.1.2.4 The software shall support up to 10 user defined traffic flow thresholds for traffic plan selection.

12.1.2.5 Traffic Responsive Operations shall automatically select timing plans based on defined traffic flow thresholds, defined as volume plus K times occupancy (V+KO).

12.1.2.6 Plans eligible for traffic responsive operations shall be stored in the local controller databases.

12.1.2.7 Plans eligible for traffic responsive operation shall be identified on a time of day/day of week basis.

12.1.2.8 The software shall compare the processed volume and occupancy value to the threshold values and select the timing plan that most closely matches the processed data value.

12.1.2.9 Each intersection in the group shall verify that the command was received and the new timing plan was implemented.

12.1.2.9.1 If the plan change fails at any intersection, the group shall revert to the local controller time of day/day of week schedule.

12.1.2.10 Traffic responsive operation shall end

12.1.2.10.1 When the processed volume and occupancy values satisfy the threshold value established for traffic responsive exit.

12.1.2.10.2 A manual command is received

12.1.2.10.3 Based on the time of day/day of week schedule

12.2 QUEUE DETECTION

12.2.1 The user shall be able to define eight (8) independent responses per intersection.

12.2.2 The user shall select the time of day/days of week the queue detection feature is active.

12.2.2.1 This shall be for each queue detector

12.2.3 In the event of a detector failure, the queue detection response associated with that detector shall be disabled.

12.2.4 Four levels of priority shall be provided

12.2.4.1 If a queue detector with higher priority is active, lower priority queue detectors trying to reduce the green time for the higher priority movement shall be ignored.

12.2.4.2 When queue detectors have equal priority and are competing for green time, the software shall ignore both queue detectors.

12.2.5 Configuration parameters for queue detection

12.2.5.1 Enable

12.2.5.1.1 Left turn or through vehicle

12.2.5.1.2 Partial priority

12.2.5.1.3 Diamond intersections

12.2.5.2 Priority

12.2.5.2.1 For each queue detection response

12.2.5.3 Maximum Time

12.2.5.3.1 User defined in seconds

12.2.5.3.2 For each queue detection response

12.2.5.3.3 Once the maximum time is reached the queue detection response shall turn off.

12.2.5.3.4 The maximum timer shall reset when all of the detectors for that queue detector turn off.

12.2.6 Left turn or through vehicle queue detection

12.2.6.1 The software shall add a user defined amount of green time when user defined detector delay or occupancy trigger points are satisfied.

12.2.6.1.1 The software shall be able to add green time to a phase

12.2.6.1.2 The software shall be able to call a phase

12.2.6.2 Configuration parameters for left turn or through vehicle queue detection

12.2.6.2.1 Detectors

12.2.6.2.2 Delay trigger point in seconds from 0 to 255.

12.2.6.2.3 Occupancy trigger point in percent from 0 to 100.

12.2.6.2.4 Green time added

12.2.6.2.5 Phase(s) green time is added to

12.2.6.2.6 Phase(s) green time is subtracted from

- If more than one phase is listed, the time subtracted shall be split evenly among the phases.
- These adjustments shall not fail the coordinator.

12.2.6.2.7 Call Phase(s)

12.2.7 Partial Priority Queue Detection

If the trigger points are met, the software shall ignore requests for partial priority until the vehicle queue length decreases or the maximum queue detection timer is exceeded.

12.2.7.1 Configuration Parameters for partial priority queue detection

12.2.7.1.1 Detectors

12.2.7.1.2 Delay trigger point

12.2.7.1.3 Occupancy trigger point

12.2.8 Diamond Intersection Queue Detection

The software shall change the diamond sequence or coordinated timing plan when the queue detectors are active.

12.2.8.1 Configuration parameters for diamond intersection queue detection

12.2.8.1.1 Detectors

12.2.8.1.2 Delay trigger point in seconds from 0 to 255

12.2.8.1.3 Occupancy trigger point in percent from 0 to 100

12.2.8.1.4 Temporary sequence

12.2.8.1.5 Temporary timing plan

12.2.8.1.6 Amount of time in minutes that temporary sequence and/or plan remain active after initiated. Acceptable values range from 0 to 60 minutes.

12.2.9 The software shall log and timestamp

12.2.9.1 When a queue detection response occurs

12.2.9.2 The data that triggered the response

12.2.10 In the event of detector failure an alarm with a timestamp shall be generated and include

12.2.10.1 The detector that failed

12.3 AUXILIARY FIELD DEVICE OPERATION

12.3.1 The software shall allow the user to program the operation of auxiliary field devices.

12.3.2 The software shall support a minimum of eight (8) different auxiliary field device configurations per table.

12.3.3 The software shall provide a minimum of four (4) auxiliary field device tables.

12.3.4 The auxiliary field device table shall be activated by any of the following means:

12.3.4.1 Schedule

12.3.4.2 Manual command

12.3.4.3 Logic functions

12.3.5 The user shall be able to program the following output states of the auxiliary field devices:

12.3.5.1 Default State

12.3.5.2 Display 1

12.3.5.3 Display 2

12.3.5.4 Display 3

12.3.6 The user shall be able to repeat any state during while the auxiliary field device table is active (i.e. Display1 -> Display 2-> Display 1).

12.3.7 Changes in the auxiliary field device state shall be user programmable by the following means:

12.3.7.1 Time of day

12.3.7.2 Assignable input pins

13 DIAMOND INTERCHANGE SEQUENCE

13.1 GENERAL

13.1.1 A hardcoded phase sequence, approved by the city, will run.

13.1.2 The software shall be capable of running the following diamond sequences and shall be able to run any combination for these sequences at an intersection. The sequence will change by time of day/day of week and/or by input from diamond interchange queue detectors.

13.1.2.1 Figure 3 - Dual Lag

13.1.2.1.1 The user shall be able to select different splits for the lagging left turns.

13.1.2.1.2 The user shall be able to keep the left turn and adjacent through movement green if there is a call on only one frontage road.

13.1.2.2 Figure 4 - TTI Phasing

13.1.2.2.1 The user shall be able to select the length of the green clearance time for the frontage roads.

13.1.2.3 Figure 6 or 7 – Lead/Lag or Lag/Lead

13.1.2.3.1 The user shall be able omit any left turn phase.

13.1.2.3.2 The user shall be able to lead and lag any left turn movement.

13.1.2.3.3 The user shall be able to keep the left turn and adjacent through movement green if there is a call on only one frontage road.

13.1.3 All diamond interchange operations shall be configurable to operate in actuated, semi-actuated, or fixed time mode.

13.1.4 The software shall smoothly transition between sequences.

13.1.4.1 The software shall not appear to skip any movement. Even if a phase is not technically skipped, the controller shall not service an outside movement twice without servicing all other outside movements that have demand.

13.1.4.1.1 The outside movement may be served twice before all other movements are served if the movement is compatible with another outside movement being served.

13.1.4.2 The software shall not advance to the next movement, serve that next movement, and then back up and serve the first movement again during a sequence change.

13.1.5 The software shall be capable of running the diamond sequences listed above with right turn overlaps on the frontage roads and arterial roads.

13.1.6 The software shall be capable of running the diamond sequences listed above with eight (8) active pedestrian channels.

13.1.6.1 Each frontage road crossing will be independent.

13.1.6.2 The arterial road crossing will be split into two independent crossings.

13.1.7 The software shall provide templates for the following traditional diamond operations for easy programming:

13.1.7.1 Figure 3 – dual lag

13.1.7.2 Figure 4 – TTI phasing

13.1.7.3 Figure 6 – Lead/lag

13.1.7.4 Figure 7 – Lag/lead

13.2 DIAMOND INTERCHANGE K-CLEARANCE

13.2.1 General Requirements

13.2.1.1 The feature shall allow the user to skip phases in the diamond sequence without violating a motorist's expectation. The expected inside interval shall be provided to the motorist even if phases are skipped.

13.2.1.2 The software shall provide an internal clearance for traffic moving from one side of the interchange to the other, providing full passage through the interchange even when phases are not be served due to low volumes.

13.2.1.3 Recommending the use of the user programmable logic statement defined in the advanced programming chapter shall not meet this requirement.

13.2.1.4 The user shall be able to skip phases during coordinated operation. In no case shall this feature cause the coordinator to fail or cause a transition.

13.2.1.5 Right turn overlaps on the frontage and arterial roadway shall continue to operate normally when phases are skipped.

13.2.1.6 Left turn overlaps on the arterial roadway shall continue to operate normally when phases are skipped.

13.2.2 Figure 3 Diamond Sequence

13.2.2.1 Uncoordinated Operation

13.2.2.1.1 When changing from the arterial roadway to the frontage road, the software shall call the appropriate inside clearance phase(s).

- If there are calls on both frontage roads, both inside clearance phases shall be provided.
- If there is only a call on frontage road one, the inside clearance phase on the other side of the diamond shall be provided.
- If there is only a call on frontage road two, the inside clearance phase on the other side of the diamond shall be provided.

13.2.2.2 Coordinated Operation

13.2.2.2.1 Arterial roadway is coordinated

- When a vehicle call is received on the frontage road the software shall determine if there is enough time to provide the appropriate inside clearance and provide a minimum green for the frontage road. If there is not, the software shall skip the frontage road that cycle.
- When a pedestrian call is received on the frontage road after the force off for the arterial phases the software shall determine if there is enough time to provide the appropriate inside clearance and provide the minimum pedestrian service. If there is not, the software shall skip the frontage road that cycle.
- If the pedestrian call is received on the frontage road before the force off for the arterial phases the software shall serve the pedestrian phase.
- The software shall serve the vehicle call, if there is time, even if the pedestrian call cannot be served that cycle.

13.2.2.3 Frontage road is coordinated

13.2.2.3.1 The software shall determine if there is enough time to serve the arterial roadway vehicle or pedestrian phase.

13.2.2.3.2 The appropriate inside clearance shall be provided even if the pedestrian phase was programmed to steel time from the subsequent phase.

13.2.3 Figure 6 or 7 Diamond Sequences

13.2.3.1 Uncoordinated Operation

13.2.3.1.1 When changing from the arterial roadway to the frontage road, the software shall call the inside clearance phase.

13.2.3.1.2 If there is a call on either frontage road the inside clearance phase, a lagging left turn for one direction, shall be provided. The first stage of the inside clearance shall clear vehicles traveling in the opposite direction of the lagging left turn. Then the first frontage road shall begin triggering the beginning of the second stage of the inside clearance. The second stage shall clear vehicles traveling in the same direction as the lagging left turn.

13.2.3.2 Coordinated Operation

13.2.3.2.1 The functionality described in the Uncoordinated Operation section shall be provided without causing a transition or coordination failure.

13.2.3.2.2 Arterial roadway is coordinated

- When a vehicle call is received on the frontage road the software shall determine if there is enough time to provide the appropriate inside clearance and provide a minimum green for the frontage

road. If there is not, the software shall skip the frontage road that cycle.

- When a pedestrian call is received on the frontage road after the force off for the arterial movement in the opposite direction of the lagging left turn the software shall determine if there is enough time to provide the appropriate inside clearance and provide the minimum pedestrian service. If there is not, the software shall skip the frontage road that cycle.
- If the pedestrian call is received on the frontage road before the force off for the arterial movement in the opposite direction of the lagging left turn the software shall serve the pedestrian phase.
- The software shall service the vehicle call, if there is time, even if the pedestrian call cannot be served that cycle.

13.2.3.2.3 Frontage road is coordinated

- The software shall determine if there is enough time to serve the arterial roadway vehicle or pedestrian phase.
- The appropriate inside clearance shall be provided even if the pedestrian phase was programmed to steel time from the subsequent phase.

13.2.4 Figure 4 Diamond Sequence

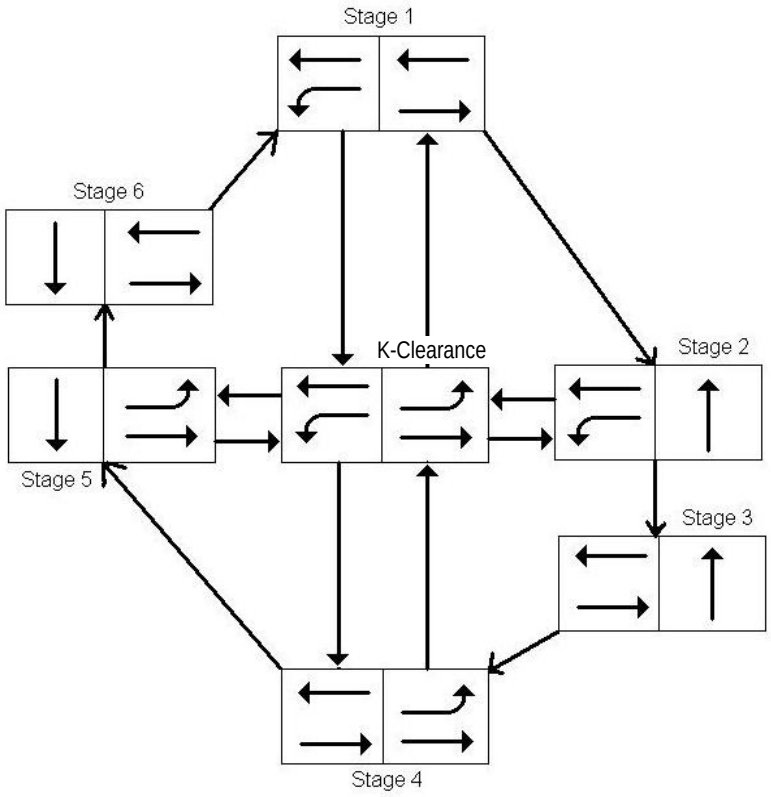


Figure 13.2.4: Figure 4 Diamond Sequence with K-clearance

13.2.4.1 Uncoordinated Operation

13.2.4.1.1 When changing from Stage 1 to Stage 4 the software shall provide the K-clearance interval.

- The northbound and westbound right turn overlap shall remain active during the K-clearance.
- The northbound and westbound right turn overlap shall remain active for an additional amount of time equal to the duration of the Stage 3 interval.

13.2.4.1.2 When changing from Stage 1 to Stage 5 the software shall provide the K-clearance interval.

- The westbound right turn overlap shall remain active during the K-clearance interval.
- The westbound right turn overlap shall remain active during for an additional amount of time equal to the duration of the Stage 6 interval.
- The user may choose to keep the westbound right turn overlap active during Stage 5.
- The user may choose to end the westbound right turn overlap during Stage 5.

13.2.4.1.3 When changing from Stage 2 to Stage 5 the software shall provide the K-clearance interval.

- Northbound green clearance, Stage 3, shall not be provided.
- The northbound right turn overlap shall remain active during the K-clearance.
- The northbound right turn overlap shall remain active for an additional amount of time equal to the duration of the Stage 3 interval.
- The user may choose to activate the westbound right turn overlap during the K-clearance.
- If the user activates the westbound right turn overlap during the K-clearance, the westbound right turn shall remain active during Stage 5.

13.2.4.1.4 When changing from Stage 2 to Stage 1 the software shall provide not provide the K-clearance interval.

- Northbound green clearance, Stage 3, shall not be provided.
- The northbound right turn overlap shall remain active during Stage 1.

13.2.4.1.5 When changing from Stage 4 to Stage 1 the software shall provide the K-clearance interval.

- The southbound and eastbound right turn overlap shall remain active during the K-clearance.

- The southbound and eastbound right turn overlap shall remain active for an additional amount of time equal to the duration of the Stage 6 interval.

13.2.4.1.6 When changing from Stage 4 to Stage 2 the software shall provide the K-clearance interval.

- The eastbound right turn overlap shall remain active during the K-clearance interval.
- The eastbound right turn overlap shall remain active for an additional amount of time equal to the duration of the Stage 3 interval.
- The user may choose to keep the eastbound right turn overlap active during Stage 2.
- The user may choose to end the eastbound right turn overlap during Stage 2.

13.2.4.1.7 When changing from Stage 5 to Stage 2 the software shall provide the K-clearance interval.

- Southbound green clearance, Stage 6, shall not be provided.
- The southbound right turn overlap shall remain active during the K-clearance.
- The southbound right turn overlap shall remain active for an additional amount of time equal to the duration of the Stage 6 interval.
- The user may choose to activate the eastbound right turn overlap during the K-clearance.
- If the user activates the eastbound right turn overlap during the K-clearance, the eastbound right turn shall remain active during Stage 2.

13.2.4.1.8 When changing from Stage 5 to Stage 4 the software shall provide not provide the K-clearance interval.

- Southbound green clearance, Stage 6, shall not be provided.
- The southbound right turn overlap shall remain active during Stage 4.

13.2.4.2 Coordinated Operation

13.2.4.2.1 The functionality described in the Uncoordinated Operation section shall be provided without causing transition or coordination failure.

13.2.4.2.2 The software shall allow the user to select the phases that may be skipped.

13.2.4.2.3 The software shall allow the user to select the coordinated phases. The green for these phases shall hold until the force off point.

14 LOGS

14.1 GENERAL

14.1.1 All log entries shall be stored with a military time and date stamp.

14.1.2 All logs shall be available to the traffic management system and through the front panel of the controller.

14.1.3 Local controller will store at a minimum all events over a seven day period.

14.1.4 The log entries shall be overwritten when full. The oldest shall be overwritten first.

14.2 GENERAL CONTROLLER LOG

14.2.1 Power – software will log each time the controller power is turned on and off.

14.2.2 External Start – software will log each time the controller receives an external restart from either MMU or external input.

14.2.3 Manual control – software will log the start time and end time when the controller is operated in manual control.

14.2.4 Cabinet door – software will log the start time and end time for any occurrence of the cabinet door being open.

14.3 CONFLICT MONITOR/MMU

14.3.1 Software shall log the start and end of each recordable fault on either the conflict monitor or MMU.

14.4 FRONT PANEL LOG

14.4.1 Software shall log all data modifications made using the front panel.

14.4.2 Software shall log the user making modifications.

14.5 CONTROLLER SOFTWARE LOG

14.5.1 The software shall record all events and actions each day.

14.5.1.1 The software shall create a file containing the events and actions and provide the daily file to the central system.

14.5.1.2 Using the file, the user shall be able to replay each event and action by the software that day on a test cabinet.

14.6 DETECTOR LOG

14.6.1 The software shall support detector diagnostics that allow testing vehicle and pedestrian detectors for no activity, maximum presence, erratic output and communication failure.

14.6.1.1 Detector failure shall generate a log event. The log will identify the detector number and pin assigned to that detector in the log data.

14.6.1.2 Detector restoration shall generate a log event. The log will identify the detector number and pin assigned to that detector in the log data.

14.7 VEHICLE SPLIT LOG

14.7.1 Software shall log actual vehicle split time (in seconds) for each phase.

14.7.1.1 Software shall log split times in seconds during free operation.

14.7.1.2 Software shall log split times in seconds during coordinated operation.

14.7.1.3 Software will log the sum of two services if a phase is serviced twice during one cycle. The logged event will include an identifier that signifies the time was split into two services.

14.7.1.4 Software will log only phases that are permitted in the controller.

14.7.1.4.1 A phase that is permitted in the controller but omitted during a certain plan will be displayed in the log with the word omit.

14.8 CYCLE TIME LOG

14.8.1 Software shall log cycle times in seconds during free operation.

14.8.2 Software shall log cycle times in seconds during coordinated operation.

14.9 COORDINATION LOG

14.9.1 Software shall log the following events related to coordination:

14.9.1.1 Change of pattern.

14.9.1.2 Start and end of transition.

14.9.1.3 Phases skipped during transition.

14.9.1.4 Coordination failure.

14.9.1.4.1 Vehicle phase that was skipped.

14.9.1.4.2 Pedestrian phase that was skipped.

14.10 PREEMPT LOG

14.10.1 Software shall log and time stamp the following events related to preempt:

14.10.1.1 Advance input start by direction.

14.10.1.2 Advance input end by direction.

14.10.1.3 Gate input start or gates down.

14.10.1.4 Gate input end of gates down.

14.10.1.5 Start and end time of preempt, including preempt identifier (preempt number)

14.10.1.6 Start and end time, vehicle ID number, direction, serviced provided or denied for all emergency vehicle preemption requests.

14.10.1.7 Time special inputs received.

14.11 TRANSIT PRIORITY LOG

14.11.1 Software shall log the following events related to transit priority:

14.11.1.1 Time of request for priority and priority identifier (what priority direction/identifier requested)

14.11.1.2 Time priority operation initiated.

14.11.1.3 End time of priority including cause for end (check-out, max time exceeded, preempt request override)

14.11.1.4 Time priority request is denied and reason for denial.

14.11.1.5 Time denied priority request is served.

14.12 SPECIAL EVENT LOG

14.12.1 Software shall log user defined special events.

14.12.1.1 Special events will be identified by input pin number.

14.12.1.2 Software shall log the start time and end time the input pin was active.

14.13 ADVANCED OPERATION EVENT LOG

14.13.1 Advanced Operations Status Screens

14.13.1.1 Traffic Responsive Operation

14.13.1.1.1 Current value of the traffic flow threshold

14.13.1.1.2 Active plan

14.13.1.1.3 Time plan started

14.13.1.1.4 Time plan ended

14.13.1.2 Queue Detection

14.13.1.2.1 Status of each queue detector

- Mode of queue detector
- Is the queue detector response active
- Is the queue detector response overridden

14.13.1.2.2 Current value of the volume or occupancy for each queue detector.

14.13.1.2.3 Current value of the maximum time for each queue detector

14.13.1.2.4 Times

- Time queue detector response started
- Time queue detector response ended

15 USER INTERFACE

15.1 GENERAL

15.1.1 The software shall provide a user interface for data entry, status monitoring, and management of the controller unit.

15.1.1.1 All features shall be accessible and programmable using the user interface.

15.1.2 The user interface shall be accessible from the controller's front panel or remote device.

15.1.2.1 The user interface shall be automatically formatted to fit the users display screen.

15.1.3 The user interface shall ONLY display parameters that are programmed, enabled, and/or relevant to the information being displayed. Unused phases, data parameters (i.e. phases, detectors, overlaps, etc.) will not be displayed.

15.1.4 The software shall provide a menu-driven display format for data entry and status information.

15.1.5 All programming must be downloadable from a remote device or the traffic management system.

15.1.6 The software shall provide an on-screen help menu.

15.2 DATA ENTRY

15.2.1 Programming displays shall be provided in menu format to assist in data entry. All display items shall be in English language and use standard traffic engineering nomenclature acceptable to the City.

15.2.2 The main menu shall allow the user to select major controller functions with submenus displayed under each major function to assist the user in identifying all entries.

15.2.2.1 The software shall provide shortcut keys for navigating the menu structure.

15.2.2.2 The user shall be able to return to the main menu in a single keystroke.

15.2.2.3 The user shall be able to return to the previous menu with a single keystroke.

15.2.3 The table title and column headings shall remain visible during scrolling.

15.2.3.1 The column heading shall include at minimum the phase number.

15.2.4 The user shall be able to easily navigate to the desired cell for data entry.

15.2.5 All data entries shall be highlighted until saved into the controller's database.

15.2.6 Information not accessible to users based on security levels shall be grayed out or omitted.

15.3 STATUS DISPLAY

15.3.1 The software shall be able to display the real time status of the controller operation.

15.3.2 The software shall provide a display with intersection status information including the following:

15.3.2.1 Controller Status

15.3.2.2 Ring status

15.3.2.3 Phase Status

15.3.2.4 Coordination Status

15.3.2.5 Preemption Status

15.3.2.6 Overlap Status

15.3.2.7 Detector Status

15.3.2.8 Communication Status

15.3.2.9 Cabinet Status

15.3.2.10 Alarm Status

15.3.2.11 Advanced Operation Status

15.3.3 The Controller Status display shall include the following information

15.3.3.1 Current Date and Time

15.3.3.2 Current sync status (free, coordinated, transition)

15.3.3.3 Current plan / pattern

15.3.3.4 Flash condition (controller or cabinet)

15.3.3.4.1 Yellow flash

15.3.3.4.2 All-red flash

15.3.3.5 Current time of day / day of week pattern

15.3.3.6 Current master cycle time

15.3.3.7 Current local cycle time

15.3.3.8 Current pattern cycle

15.3.3.9 Current offset time

15.3.3.10 Special Function Output

15.3.3.11 Alarm Status

15.3.4 The Ring Status display shall include the following information for each enabled ring.

15.3.4.1 Active phase(s) on the ring including vehicle state (Red, Yellow, Green, Next), pedestrian state (Walk, Flashing Don't Walk, Don't Walk), vehicle and pedestrian calls.

15.3.4.2 Minimum green timer in seconds for active phase (s)

15.3.4.3 Maximum green timer in seconds for active phase(s)

15.3.4.4 Gap or passage timer in seconds for active phase(s)

15.3.4.5 Walk timer in seconds for active pedestrian phase(s)

15.3.4.6 Flashing don’t walk timer in seconds for the active pedestrian phase(s)

15.3.4.7 Yellow clearance timer in seconds for the active phase(s)

15.3.4.8 Red clearance timer in seconds for the active phase(s)

15.3.4.9 Reason for termination of the active phases: force-off, max out, gap out.

15.3.4.9.1 The reason for termination shall remain on the display until the next time the phase turns green.

15.3.5 The Phase Status display shall include the following information for each enabled phase.

15.3.5.1 Phase On

15.3.5.2 Vehicle Call

15.3.5.3 Pedestrian Call

15.3.5.4 Vehicle Extension
15.3.5.5 Vehicle Red
15.3.5.6 Vehicle Yellow
15.3.5.7 Vehicle Green
15.3.5.8 Pedestrian Walk
15.3.5.9 Pedestrian Clearance
15.3.5.10 Pedestrian Don't Walk
15.3.5.11 Phase Next

15.3.6 The Coordination Status display shall include the following information
15.3.6.1 Coordination Cycle
15.3.6.2 Coordination Sync
15.3.6.3 Free Status
15.3.6.4 Pattern Status

15.3.7 The Preemption Status display shall include the following information for each preempt sequence
15.3.7.1 Active/Not Active
15.3.7.2 Current State
15.3.7.1 Active State or Normal or Emergency Vehicle Preempt
15.3.7.1.1 Entry One
15.3.7.1.2 Entry Two
15.3.7.1.3 Dwell
15.3.7.2 Active State of Smooth Preemption
15.3.7.2.1 Active Line

15.3.8 The Overlap Status display shall include the following information for each enabled overlap:
15.3.8.1 Overlap Red
15.3.8.2 Overlap Yellow
15.3.8.3 Overlap Green
15.3.8.4 Overlap timers (green, yellow, red)

15.3.9 The Detector Status display shall include the following information for each enabled detector:
15.3.9.1 Active/Not Active
15.3.9.2 Vehicle Detector Alarms
15.3.9.3 Pedestrian Detector Alarms
15.3.9.4 Delay and Extension Timers
15.3.9.5 Delay and Extension inhibit
15.3.9.6 Volume

15.3.9.7 Occupancy

15.3.9.8 Failed

15.3.9.8.1 No response programmed (always off)

15.3.9.8.2 Minimum recall

15.3.9.8.3 Maximum recall (always on)

15.3.10 The Communication Status display shall include the following information:

15.3.10.1 Field to Central (i.e. system) Communication

15.3.10.1.1 Link Status

15.3.10.1.2 Send/Receive Status

15.3.10.2 Peer-to-Peer Communication

15.3.10.2.1 Peer Link Status

15.3.10.2.2 Peer Send/Receive

15.3.11 The Cabinet Status Display shall include the following information:

15.3.11.1 Cabinet Fault Status

15.3.11.2 Channel Status

15.3.11.2.1 Channel Red

15.3.11.2.2 Channel Yellow

15.3.11.2.3 Channel Green

15.3.11.3 Assignable Input Status

15.3.11.4 Assignable Output Status

15.3.12 Advanced Operations Status Screens

15.3.12.1 Traffic Responsive Operation

15.3.12.1.1 Current value of the traffic flow threshold

15.3.12.1.2 Active plan

15.3.12.1.3 Time plan started

15.3.12.1.4 Time plan ended

15.3.12.2 Variable mode of left turn operation

15.3.12.2.1 Current mode of left turn operation by left turn

15.3.12.2.2 Current value by left turn of the volume and density data

- Cycle by cycle
- 15 minute rolling average

15.3.12.2.3 Trigger point timers by left turn

- Time to be less restrictive
- Time to be more restrictive
- Time between mode changes
- Time of last mode change by left turn

15.3.12.3 Variable lagging left turn splits

15.3.12.3.1 Current value of the calculated left turn split for each left turn

15.3.12.4 Traffic Responsive Flash

15.3.12.4.1 Current value of the 15 minute rolling average volumes scaled up to a one hour volume.

- Main street volume
- Minor street approach volume 1
- Minor street approach volume 2

15.3.12.4.2 The value of the trigger point timers

- Time to be less restrictive
- Time to be more restrictive
- Time between mode changes

15.3.12.4.3 Current mode of operation

15.3.12.4.4 Time of last mode change

15.3.12.5 Queue Detection

15.3.12.5.1 Status of each queue detector

- Mode of queue detector
- Is the queue detector response active
- Is the queue detector response overridden

15.3.12.5.2 Current value of the volume or occupancy for each queue detector.

15.3.12.5.3 Current value of the maximum time for each queue detector

15.3.12.5.4 Times

- Time queue detector response started
- Time queue detector response ended

15.3.12.6 Cycle-by-Cycle Split Adjustments

15.3.12.6.1 Current rolling average occupancies for each phase.

15.3.12.6.2 Current splits for each phase

15.3.12.6.3 Current percentage of the cycle for each phase

15.3.12.6.4 Last change in split for each phase

15.3.12.6.5 Total change in split for each phase

15.3.12.6.6 Times

- Start of adjustments
- End of adjustments

15.3.12.7 Auxiliary Field Device Transition Table

15.3.12.7.1 Current Output

- Default
- Other Output

16 MISCELLANEOUS

16.1 SPECIAL FUNCTION/TIME OF DAY OUTPUTS

16.1.1 The controller shall provide 10 user definable special function outputs.

16.1.2 All special functions shall be capable of being activated by schedule or inputs.

16.1.3 The software shall be capable of displaying the current status (on/off) of each special function.

16.2 ALARMS

16.2.1 The software shall support a minimum of 48 pre-defined and/or user defined alarms.

16.2.2 All alarms shall be logged.

16.2.3 The user shall be able to configure each alarm to generate a message that will be transmitted to the Central Supervisory System.

16.2.4 The user shall be able to trigger any physical input as an alarm.

16.2.5 All Alarms shall be classified as one of the following types.

- 16.2.5.1 Critical
- 16.2.5.2 Non Critical
- 16.2.5.3 Detector Fault
- 16.2.5.4 Coordination
- 16.2.5.5 Communication
- 16.2.5.6 Preempt

16.2.6 Critical Alarms shall include, at a minimum, the following:

- 16.2.6.1 Power Failure (Intersection is Dark)
- 16.2.6.2 Stop Time
- 16.2.6.3 Local Flash
- 16.2.6.4 MMU flash
- 16.2.6.5 Configuration Failure
- 16.2.6.6 Cycle Fail
- 16.2.6.7 Clock Failure
- 16.2.6.8 Hardware Failure

16.2.7 Non Critical Alarms shall include, at a minimum, the following:

- 16.2.7.1 External Start
- 16.2.7.2 Battery Back-up is active
- 16.2.7.3 Cabinet Door Open
- 16.2.7.4 Maximum Temperature Exceeded
- 16.2.7.5 Fan off
- 16.2.7.6 Cabinet Light Out

16.2.7.7 Local Override

16.2.8 Coordination alarms shall include, at a minimum, the following:

16.2.8.1 Coordination active

16.2.8.2 Offset transitioning

16.2.8.3 Local free

16.2.8.4 Coordination alarm

16.2.8.5 Coordination fault

16.2.8.6 Cycle fault

16.2.9 Communication alarms shall include, at a minimum, the following:

16.2.9.1 System communication fail

16.2.9.2 Peer to peer fail

16.2.10 Preempt alarms shall include, at a minimum, the following:

16.2.10.1 Railroad preempt

16.2.10.2 Emergency vehicle preempt

16.2.11 Priority alarms shall include, at a minimum, the following:

16.2.11.1 Full priority

16.2.11.2 Partial priority

16.2.11.3 Bus priority

16.3 DIAGNOSTICS

16.3.1 The software shall provide the following diagnostics:

16.3.1.1 Cabinet

16.3.1.2 Configuration

16.3.1.3 Detector

16.3.1.3.1 Defined in Section 3

16.3.1.4 Cycle

16.3.1.4.1 Yellow Clearance less than 3.0

16.3.1.5 Coordination

16.3.1.5.1 Splits not equal to cycle lengths

16.3.1.5.2 Errors in shortway transition

16.3.1.5.3 Split times less than pedestrian crossing time

16.4 TIMING SHEETS

16.4.1 The software shall provide the following types of timing sheets

16.4.1.1 Full timing sheets

16.4.1.1.1 The full timing sheets shall include all database parameters

16.4.1.2 Working timing sheets

16.4.1.2.1 Working timing sheets shall include only active or used parameters

- A template shall be created for a typical intersection with special left turn displays.
- A template shall be created for a typical diamond intersection for the Figures 3, 4, 6, and 7.

16.4.1.2.2 Working timing sheets shall be a maximum of six (6) pages (8 ½ inches x 11 inches)

- The font shall be at least aerial narrow font size 8.

16.4.1.2.3 The working time sheet shall be printable in legal size paper. The legal size timesheet shall have additional room in the field for noting changes.

16.4.1.2.4 The City will approve the timesheet design for each template.

16.4.2 The user shall be able to upload the timing sheets to the central system or remote device.

17 DESIRABLE FEATURES

17.1 VEHICLE DETECTOR CONFIGURATION DESIRABLE FEATURES

17.1.1 Variable Lagging Left Turn Splits

17.1.1.1 Add Time Detectors

17.1.1.2 Subtract Time Detectors

17.1.2 Cycle-by-Cycle Split Adjustments

17.1.2.1 Detectors will provide occupancy data for the Cycle-by-Cycle Split Adjustments.

17.2 VEHICLE DETECTOR TIMING DESIRABLE FEATURE

17.2.1 Variable lagging left turn split add or subtract time.

17.3 SMOOTH PREEMPT CONFIGURATION

Smooth preemption is a user defined table with several intervals. The user shall be able to define the duration of each interval. While the table is active, the software shall operate the traffic signal in free mode within the constraints defined by the user. On each line, the user shall define the permitted vehicle and pedestrian phases, phases that will hold green, phases that must terminate immediately, phases that must terminate after the minimums are satisfied, vehicle and pedestrian phases with calls, phases with soft recalls, and special outputs that are active. If the line is not a holding line, software shall advance to the next interval once the current interval timer has expired. The software shall still respond to inputs from the pedestrian push buttons and vehicle detection system if they are within the constraints defined by the user for that line. The smooth preemption table shall be able to hold at two intervals: the first will hold on the Entry interval until the gates active input is received and the second will hold on the Dwell interval until the gates not active is received.

17.3.1 Any of the 12 unique preempt sequences shall be configurable as a smooth preempt type.

17.3.2 The software shall allow the user to program at least 15 intervals in the smooth preemption sequence.

17.3.3 The smooth preemption mode shall allow the preemption sequence to omit the clearance phase under the following conditions:

17.3.3.1 Detectors are installed, functional and capable of detection vehicles on or approaching the railroad.

17.3.3.1.1 If a detector that detects vehicles past the presignal or on the railroad tracks fails, track clearance will always be provided. The input for the failed input will be always on if the detector fail mode is maximum recall.

17.3.3.1.2 The user will select which detector inputs are required to detect motorists on the track.

17.3.3.1.3 Vehicles are detected on the railroad tracks or between the railroad tracks and the intersection.

17.3.4 The software shall hold in the dwell phases during track clearance. The software shall provide track clearance if either of the following conditions are true:

17.3.4.1 A vehicle is detected between the stop bar at the railroad tracks and the intersection

17.3.4.2 A detector monitoring the area from the stop bar to the intersection has failed.

17.3.5 The Entry line in the smooth preemption table will allow the use to hold in the Dwell phases. The Dwell phases shall immediately end if a vehicle is detected. Then the Entry phases shall begin.

17.3.5.1 If track clearance is requested, the software shall hold the track clearance phases green as long as vehicles are detected or the gate activation input is received.

17.3.6 The user will be able to define:

17.3.6.1 Time

This is the amount of time in seconds each interval in the smooth preemption sequence will last.

17.3.6.2 Pedestrian Call

One call will be placed for the phases entered.

17.3.6.3 Holding Phases

Once any phases entered as a holding phase become active it shall remain green. A hold is a continuous extension.

17.3.6.3.1 The maximum green shall not end a holding phase.

17.3.6.3.2 The phase shall remain green until the software advances to a line in the preemption table that does not have the phase listed as a holding phase.

17.3.6.4 Advance

These phases if active will immediately end.

17.3.6.4.1 Any active vehicle phase will end immediately. Minimum green programming is ignored.

17.3.6.4.2 Any active pedestrian phase will end immediately. The pedestrian phase will be truncated.

17.3.6.5 Force Off

These phases if active will end as soon as all minimums are met. A pedestrian phase will be truncated.

17.3.6.5.1 Any active vehicle phase will end after the minimum green is provided.

17.3.6.5.2 Any active pedestrian phase will end after the vehicle phase minimum green is provided.

17.3.6.6 Call

These phases will have a constant minimum recall.

17.3.6.6.1 Other phases permitted on that line in the smooth preemption table shall be able to receive calls from the detectors.

17.3.6.7 Soft Recall

These phases shall have a call only if no other permitted phases on that line in the smooth preemption table have a call.

17.3.6.8 Permit

These phases shall be able to turn green if there is a call for the phase.

17.3.6.8.1 Phase entered in the special event table shall be allowed to turn green even if they are omitted elsewhere in the software.

17.3.6.8.2 These phases cannot accept extensions.

17.3.6.9 Omit Vehicle Overlap

These overlaps shall begin clearing immediately once the interval is active. If the overlap is already red, it shall remain red.

17.3.6.10 Omit Pedestrian Phase or Pedestrian Overlap

These pedestrian phases and overlap shall not be allowed to begin.

17.3.6.10.1 Any call for these pedestrian phases and overlaps will latch and a call will be placed for the pedestrian movements once the omits are lifted.

17.3.6.11 Special Output

These outputs shall be used to activate auxiliary devices.

17.3.6.11.1 The special output shall remain on as the software advances to the next interval if that special output is entered in the next interval.

17.3.7 The permitted window for a phase in the coordinated timing plan will not cause a phase to end while smooth preemption is active.

17.3.8 The user shall be able to select the inputs that will cause the software to hold in a certain preemption state. There shall be two holding lines: the Entry phase line will hold during the advance railroad inputs and the Dwell phase line will hold during the gates down input.

17.3.8.1 The first preemption input shall activate the preemption sequence. The software shall advance through the preemption intervals to the first holding line and remain on that line until the first input turns off.

17.3.8.1.1 The first hold will be the entry phases.

17.3.8.1.2 The time entered for the Entry line shall not count until the hold input turns off and the software wants to advance.

17.3.8.1.3 The software shall continue to hold on the line regardless of the state of the second input.

17.3.8.2 Once the first input turns off and the second input is active the software shall advance to the next line in the table. If the railroad does not turn off the first signal when the second signal turns on, the software shall provide the logic functions to turn off the first input.

17.3.8.2.1 The second hold will be the dwell interval.

17.3.8.2.2 The time entered for the hold shall not count until the holding input turns off and the software wants to advance.

17.3.8.2.3 The software shall continue to hold on the second holding line until the second input turns off.

17.3.9 Preemption shall override all priorities.

17.3.10 High priority preempts shall override low priority preempts.

17.3.10.1 A request for a high priority preemption event shall immediately cancel any active low priority preemption event and begin the high priority event.

17.3.11 Low priority preempts shall be ignored until the high priority preempt terminates.

17.3.11.1 The low priority event shall begin running in the background. Once the inputs for high priority event terminates, the high priority event immediately end and the low priority event shall output its current state.

17.3.11.2 Any part of the high priority event that occurs after the high priority event input terminates shall be cancelled. The software shall immediately output the low priority event

17.3.12 Equal priority preempts shall be served on a first called, first served basis.

17.3.12.1 The second preemption sequence shall begin running in the background. Once the inputs for first preemption sequence turn off the first sequence shall immediately end and second preemption sequence shall output its current state.

17.3.12.2 Any part of the first preemption sequence that occurs after the first preemption input turns off will be cancelled. The software shall immediately output the second preemption sequence.

17.4 TRAFFIC ADAPTIVE OPERATION

If the Proposer has an adaptive solution the City desires a presentation of the functionality and a bid.

The controller software shall not be responsible for traffic adaptive decisions. An independent traffic adaptive computer will be installed at each intersection in the group. The traffic adaptive computer will process detector data, communicate with other traffic adaptive computers in the group of intersections, and provide outputs to the controller. The controller shall, using standard controller software features, respond to inputs sent from the traffic adaptive computer. These inputs shall be understood by the controller without any modification to the controller software.

17.4.1 A traffic adaptive system shall provide inputs to the controller software and those inputs shall be understood by the controller software without any modifications to the controller software.

17.4.2 The controller software shall operate in free mode while the intersection is operating in adaptive mode. The traffic adaptive computer shall provide inputs for the controller software.

17.4.2.1 The controller software shall allow the user to assign an input to free mode operation. The controller software shall operate the intersection in free mode when the input is active.

17.4.3 The user shall define sub groups of intersections within the group. Any traffic adaptive computer or peer-to-peer communication failure shall cause the traffic adaptive computer to cancel free mode. The controller software shall revert back to normal operation based on the time of day/day of the week schedule.

17.4.3.1 If the controller software loses peer-to-peer communication with another controller in the subgroup, it will exit free mode.

17.4.3.2 The controller software shall command other intersections in the subgroup to exit free mode.

17.5 VARIABLE MODE OF LEFT TURN OPERATION

The controller software will vary the mode of left turn operation based on the current traffic volumes and/or detector occupancy. The user will define the mode of left turn operation the controller software can select. The user will enable this feature for each left turn by the time of day/day of week.

17.5.1 The software shall provide this operation for at least four (4) left turns.

17.5.2 The software shall allow the user to select the times of day/days of week that this feature is active for each left turn.

17.5.3 The user shall select the modes of operation the controller software may choose for each left turn.

17.5.3.1 Protected only

17.5.3.2 Permitted/protected

17.5.3.3 Permitted only

17.5.4 Changes in the mode of left turn operation shall occur when all of the phases associated with a left turn are red.

17.5.5 The software shall process the following data from the detection system for each left turn.

17.5.5.1 The left turn volume

17.5.5.2 Opposing through volume.

17.5.5.3 Opposing left turn volume.

17.5.5.4 Opposing left turn detector occupancy

17.5.5.4.1 The detector occupancy shall be the measured during the protected and permitted green for the oncoming left turn.

17.5.6 The software shall be capable of receiving global changes to the trigger points from the central system. The user will make a change in one master table for a group of intersections through the central system software and download that change to the entire group.

17.5.7 The controller software shall calculate the product of the left turn volume and the oncoming through volume. The software shall allow the user to define trigger points that will be the boundary between the modes of left turn operation.

17.5.8 The controller software shall measure the oncoming left turn volume and occupancy. The software will allow the user to define trigger points that will be the boundary between the modes of left turn operation.

17.5.9 Trigger Points

These are the boundaries between the modes of left turn operation. If the data crosses the boundary, the software will want to change the mode of left turn operation.

17.5.9.1 Trigger points for the product of the oncoming through and left turn volumes.

17.5.9.1.1 The user shall be able to enter two volume trigger points between 10,000 and 200,000.

17.5.9.1.2 One trigger point will be the boundary between protected only and protected/permitted

17.5.9.1.3 One trigger point will be the boundary between protected/permitted and permitted only.

17.5.9.2 Trigger points for the oncoming left turn volumes and occupancy

17.5.9.2.1 The user shall be able to define two volume trigger points between 0 and 1000.

- One trigger point will be the boundary between protected only and protected/permitted.
- One trigger point will be the boundary between protected/permitted and permitted only.

17.5.9.2.2 The user shall be able to define two occupancy trigger points between 0 and 100 percent.

- One trigger point will be the boundary between protected only and protected/permitted.
- One trigger point will be the boundary between protected/permitted and permitted only.

17.5.9.3 The software shall provide two ways to aggregate data and compare it to the trigger points.

17.5.9.3.1 Cycle by cycle: the data shall cross a trigger point boundary each cycle for at least the minimum amount of time before the software will want to change the mode of left turn operation.

17.5.9.3.2 15 minute rolling average: the 15 minute rolling average of the data shall cross a trigger point boundary for at least the minimum amount of time before the software will want to change the mode of left turn operation.

17.5.9.4 Trigger point timer

The data shall meet a trigger point for a user defined amount of time before the software will change the mode of left turn operation. A mode of left turn operation shall be active for a user defined minimum amount of time before the software will change the mode of operation.

17.5.9.4.1 Minimum Time to Be Less Restrictive

This is the amount of time in minutes that the data shall be less than the trigger point before the software can change the mode of left turn to a mode that is less restrictive.

- There shall be a timer for each calculation for each left turn.

17.5.9.4.2 Minimum Time to Be More Restrictive

This is the amount of time in minutes that the data shall be more than the trigger point before the software can change the mode of left turn to a mode that is more restrictive.

- There shall be a timer for each calculation for each left turn.

17.5.9.4.3 Minimum Time between Mode Changes

This is the amount of time in minutes between changes in the mode of left turn operation.

- The software shall not change the mode of left turn operation until the minimum time between mode changes has elapsed.
- The timers for the minimum time to be less restrictive and the minimum time between mode changes shall time concurrently.

- The timers for the minimum time to be more restrictive and the minimum time between mode changes shall time concurrently.
- If the variable mode of left turn feature is disabled by manual override or the time of day/day of week schedule the minimum time between mode changes timer shall not apply.

17.5.10 The user shall be able to activate the oncoming through and oncoming left turn calculations at the same time. When both are active, the software shall determine the desired mode of left turn operation for each calculation.

17.5.10.1 If the calculations select different modes of left turn operation, the software shall allow the user to select the more or less restrictive mode of left turn operation.

17.5.11 If a detector fails, the mode of left turn operation will turn off for the effected left turn.

17.5.11.1 The left turn shall return to the mode of operation programmed in the time of day/day of week schedule.

17.5.11.2 An alarm will be generated that includes:

17.5.11.2.1 The left turn effected

17.5.11.2.2 The mode of operation for that left turn

17.5.11.2.3 A timestamp

17.5.12 Events shall be logged and time stamped for each left turn.

17.5.12.1 When the feature turns on

17.5.12.2 When the feature turns off

17.5.12.3 Any changes in the mode of left turn operation

17.5.12.4 The raw data for each cycle used in the calculation

17.5.12.5 The calculations for each cycle

17.5.13 Configuration parameters for variable mode of left turn operation

17.5.13.1 Enable

17.5.13.1.1 By left turn

17.5.13.1.2 For all left turns

17.5.13.1.3 Selected based on time of day/day of week schedule

17.5.13.2 Enable oncoming through calculation

17.5.13.2.1 By left turn

17.5.13.2.2 For all left turns

17.5.13.2.3 Selected based on time of day/day of week schedule

17.5.13.3 Enable oncoming left turn calculation

17.5.13.3.1 By left turn

17.5.13.3.2 For all left turns

17.5.13.3.3 Selected based on time of day/day of week schedule

17.5.13.3.4 Select volume

17.5.13.3.5 Select occupancy

17.5.13.4 Data aggregation

17.5.13.4.1 Per cycle

17.5.13.4.2 Rolling average

17.5.13.4.3 Number of minutes included in the rolling average

17.5.13.5 Minimum time to become more restrictive

17.5.13.5.1 For each left turn

17.5.13.5.2 For all left turns

17.5.13.6 Minimum time to become less restrictive

17.5.13.6.1 For each left turn

17.5.13.6.2 For all left turns

17.5.13.7 Minimum time between changes in left turn operation

17.5.13.7.1 For each left turn

17.5.13.7.2 For all left turns

17.5.13.8 Mode of left turn operation when both calculations are active

17.5.13.8.1 More restrictive mode

17.5.13.8.2 Less restrictive mode

17.5.13.9 Permitted modes of left turn operation.

17.5.13.9.1 By left turn

17.5.13.9.2 For all left turns

17.5.13.9.3 Selected based on time of day/day of week schedule

17.5.13.9.4 Modes of left turn operation

- Protected only
- Protected/Permitted
- Permitted only

17.5.13.10 Oncoming through trigger points

17.5.13.10.1 By left turn

17.5.13.10.2 For all left turns

17.5.13.10.3 Trigger point between protected only and protected/permitted

17.5.13.10.4 Trigger point between protected/permitted and permitted only

17.5.13.11 Oncoming left turn calculation

17.5.13.11.1 By left turn

17.5.13.11.2 For all left turns

17.5.13.11.3 Volume trigger point between protected only and protected/permitted

17.5.13.11.4 Occupancy trigger point between protected only and protected/permitted

17.5.13.11.5 Volume trigger point between protected/permitted and permitted only

17.5.13.11.6 Occupancy trigger point between protected/permitted and permitted only

17.6 VARIABLE LAGGING LEFT TURN SPLITS

The controller will vary the split for a lagging left turn when the software is operating in coordinated mode. The split will be determined based on the traffic in the left turn lane that cycle. The beginning of the lagging left turn phase will be moved later and the time not used by the lagging left turn will be added to the split for the oncoming through movement.

17.6.1 The end of the left turn shall not be adjusted by this advanced operation.

17.6.1.1 Other advanced operation features may adjust the end of the lagging left turn.

17.6.2 The software shall provide at least a minimum split if there is a call for the lagging left turn phase.

17.6.3 The software will delay the beginning of the lagging left turn.

17.6.3.1 The software shall delay the beginning of the lagging left turn based on the number of vehicles in the left turn lane that cycle.

17.6.3.2 The amount of time not needed for the lagging left turn split shall be added to the green interval for the opposing through movement.

17.6.3.3 Calculating the left turn split.

17.6.3.3.1 Each vehicle entering the left turn lane will pass through a detection point.

- Each detection will add a user defined amount of time to the left turn split up to the maximum split for the active plan.
- The software shall allow the user to define these detectors for each left turn.
- Time shall be added to the left turn split regardless of the active phases.

17.6.3.3.2 Each vehicle exiting the left turn lane will pass through a detection point.

- Each detection will subtract a user defined amount of time from the left turn split to the active minimum green time.
- The software shall allow the user to define these detectors for each left turn.
- Time shall be subtracted from the left turn split regardless of the active phases.

- The software shall not subtract time from the left turn split for a user defined amount of time in seconds after the beginning of the left turn phase green.

17.6.3.3.3 The software will reset the calculated left turn split to zero (0) at the beginning of green for the left turn.

- The calculated left turn split shall not be less than zero (0) seconds.
- If the left turn is served more than once per cycle, the calculated left turn split shall be reset at the beginning of each green for the left turn.

17.6.4 The software shall provide this operation for at least four (4) left turn movements.

17.6.5 If the left turn is not lagging, the feature shall have no effect.

17.6.6 In the event of a detector failure the programmed split will be provided.

17.6.7 In the event of a detector failure, an alarm with a timestamp will be generated that includes.

17.6.7.1 The left turn effected

17.6.8 Configuration Parameters

17.6.8.1 Enable

17.6.8.1.1 By left turn

17.6.8.1.2 For all left turns

17.6.8.1.3 Selected based on time of day/day of week schedule

17.6.8.2 Added and Subtracted Time

This is the time in tenths of seconds added to or subtracted from the calculated left turn split for each vehicle.

17.6.8.3 Detectors that add time

17.6.8.3.1 If the detection is associated with more than one phase, the time will be added to the lagging left turn phase. Other phases will not be effected.

17.6.8.4 Detectors that subtract time

17.6.8.4.1 If the detection is associated with more than one phase, the time will be subtracted from the lagging left turn phase. Other phases will not be effected.

17.6.8.5 Disable Subtraction Detectors

This is the amount of time in seconds after the lagging left turn phase turns green that time will not be subtracted from the left turn split for vehicles passing through the subtraction detection points.

17.6.8.5.1 The user shall be able to define this amount of time for each left turn.

17.7 TRAFFIC RESPONSIVE FLASH OPERATION

17.7.1 The software will select normal operation, yellow flash, or all-red flash based on current traffic volumes.

17.7.2 The user shall select the time of day/days of week the software may choose the mode of operation.

17.7.3 The software will allow the user to select trigger points for the volumes.

A trigger point is the boundary between the modes of traffic signal operation. If the data crosses the boundary, the software will want to change the mode traffic signal operation.

17.7.3.1 Three (3) sets of trigger points will be provided. One set for each of the three (3) volume signal warrants defined the current edition of the Manual on Uniform Traffic Control Devices.

17.7.3.1.1 The software will allow the user to select the signal warrant that will be used to determine the mode of traffic signal operation.

17.7.3.2 The software shall allow the user to define a K value to scale the traffic volume data collected by the data collection system.

17.7.3.2.1 Two K values shall be provided.

- One for the major street volume.
- One for the minor street volumes.
- The K values shall range from at least 10 percent to 200 percent.
- The user shall be able to vary the K values by Time of Day/ Day of Week.

17.7.3.3 The software shall allow the user to select one (1) to 60 minute rolling average volume that shall be scaled up to one hour volume to determine if the signal warrant is met.

17.7.3.3.1 If a signal warrant is met, the software will want to change to normal operation.

17.7.3.3.2 If a signal warrant is not met, the software will want to change to yellow-red or all-red flash operation.

17.7.3.4 Minimum Time before Changing To Normal Operation

This is the amount of time in minutes that the data shall be more than the trigger point before the software shall change to normal operation.

17.7.3.5 Minimum Time before Changing To Flash Operation

This is the amount of time in minutes that the data shall be less than the trigger point before the software shall change to flash operation.

17.7.3.6 Minimum Time between Changes

This is the amount of time in minutes between changes in the mode of traffic light operation. The timers for minimum time before changing to normal operation and minimum time before changing to flash operation shall time concurrently. The software shall not change the mode of traffic light operation until the minimum time between mode changes has elapsed.

17.7.4 If a detector fails, the software will change operation based on the time of day/day of week schedule.

17.7.4.1 The minimum time between changes must be satisfied.

17.7.5 In the event of a detector failure, an alarm with a timestamp will be generated.

17.7.5.1 The new mode of operation, which is based on the Time of Day/Day of Week schedule shall be included.

17.7.6 Changes in the mode of traffic light operation shall be logged.

17.7.6.1 The mode of traffic light operation

17.7.6.2 The volumes for the main street

17.7.6.3 The volumes for each minor street approach

17.7.6.4 Timestamp

17.7.7 Configuration parameters for the variable mode of traffic light operation.

17.7.7.1 Enable

17.7.7.1.1 Selected based on time of day/day of week schedule

17.7.7.2 The number of lanes on the major street

17.7.7.2.1 One (1) lane

17.7.7.2.2 Two (2) or more lanes

17.7.7.3 The number of lanes on minor street approach one

17.7.7.3.1 One (1) lane

17.7.7.3.2 Two (2) or more lanes

17.7.7.4 The number of lanes on minor street approach two

17.7.7.4.1 One (1) lane

17.7.7.4.2 Two (2) or more lanes

17.7.7.5 K value for the major street

17.7.7.6 K value for the minor street

17.7.7.7 Active Signal Warrant

17.7.7.7.1 Warrant 1, Eight-Hour Vehicular Volume

17.7.7.7.2 Warrant 2, Four-Hour Vehicular Volume

17.7.7.7.3 Warrant 3, Peak Hour

17.8 CYCLE-BY-CYCLE SPLIT ADJUSTMENTS

While running coordination, the software will adjust the splits for all of the phases to balance the delay at the intersection. In no case shall the feature cause the coordinator to fail.

17.8.1 The software shall adjust the green time for every active phase based on data collected by the detection system.

17.8.1.1 The software shall collect the detector occupancy while the phase is green.

17.8.1.2 If there are multiple detectors for a movement the occupancies will be averaged.

17.8.1.3 A rolling average of the occupancy data will be used to determine the cycle-by-cycle split adjustments.

17.8.1.3.1 The software shall allow the user to select the amount of time in minutes from at least one (1) to 30.

17.8.2 Cycle-by-cycle split adjustments shall be enabled by:

17.8.2.1 Time of day/day of week schedule

17.8.2.2 Manual command

17.8.3 The minimum occupancy, defined by the user, shall be exceeded by at least the rolling average occupancy for one phase before the cycle-by-cycle split adjustments feature will activate.

17.8.4 When a new plan is called, the software shall proportionally apply the current adjustments to the new plan.

17.8.5 If there are multiple detectors for a phase, the occupancy shall be averaged

17.8.6 The software shall continue to run the active coordination plan while this feature is active.

17.8.6.1 If time is added to the split for the coordinated movement, half of the adjustment shall be added to the active offset.

17.8.6.2 If time is subtracted from the split for the coordinated movement, half of the adjustment shall be subtracted from the offset.

17.8.7 Configuration parameters for Cycle-by-Cycle Split Adjustments

17.8.7.1 Enable

17.8.7.2 Detectors

17.8.7.2.1 Phase associated with that detector.

17.8.7.3 Number of cycles included in the rolling average.

17.8.7.4 Maximum Green Shift per Cycle

This is the maximum amount of green that shall be added or subtracted during an adjustment.

17.8.7.4.1 For each phase

17.8.7.4.2 Percentage of the cycle

17.8.7.4.3 Amount of time in seconds

17.8.7.5 Maximum Total Green Add

17.8.7.5.1 For each phase

17.8.7.5.2 Percentage of the cycle

17.8.7.5.3 Amount of time in seconds

17.8.7.6 Maximum Total Green Reduction

17.8.7.6.1 For each phase

17.8.7.6.2 Percentage of the cycle

17.8.7.6.3 Amount of time in seconds

17.8.7.7 Minimum occupancy to activate cycle-by-cycle split adjustments

17.8.7.7.1 This feature shall turn off once the rolling average occupancies for all phases are below the minimum occupancy.

17.8.8 The software shall log and timestamp

17.8.8.1 The rolling average of the occupancy for each phase

17.8.8.2 The splits that were calculated by the software each cycle.

17.8.9 In the event of detector failure an alarm with a timestamp shall be generated and include

17.8.9.1 The detector that failed

17.9 AUXILIARY FIELD DEVICE TRANSITION TABLE

These tables will be used to change the state of auxiliary field devices. For example if a lane control sign needs to change from left only to through only, the user will program a time of day output to activate the auxiliary field device output transition table. The first line of the table will output left only to the lane control sign. The second line of the table will output left/through to the lane control sign. The third line of the table will output through only to the lane control sign. The third line will also be the holding line so the through only will be displayed as long as that time of day output is active. When the time of day output turns off, the software shall move to the fourth line and output a left/through to the lane control sign. Finally the fifth line of the table will output left only. Then software will exit the table.

17.9.1 The software shall provide at least four (4) transition sequence tables for auxiliary field devices.

17.9.2 The time of day outputs shall be linked to the assignable outputs table in the logic functions.

17.9.3 The software shall be capable of using the time of day outputs to activate or change the state of field equipment.

17.9.4 When the output turns off the software shall finish running the transition table.

17.9.5 The software shall be capable of outputting a default state to the auxiliary field device when the transition table is not active.

17.9.6 Configuration parameters

17.9.6.1 Enable

17.9.6.2 Time

This is the amount of time in minutes that the line in the transition sequence table shall remain active.

17.9.6.3 Output

This is the state of the auxiliary field device while this line in the transition sequence table is active.

17.9.6.3.1 The user shall be able to enter the state of the auxiliary device in the table. The software shall output that state when that line in the table is active.

17.9.6.4 Default Output

This is the state of the auxiliary device when the transition table is not active.

17.9.6.5 Holding Line

The table will hold on this line as long as the time of day output is on that activated the table.

17.10 LOGS FOR DESIRABLE FEATURES

17.10.1 Variable mode of left turn operation

17.10.1.1 Current mode of left turn operation by left turn

17.10.1.2 Current value by left turn of the volume and density data

17.10.1.2.1 Cycle by cycle

17.10.1.2.2 Rolling average

17.10.1.3 The value of the trigger point timers by left turn

17.10.1.3.1 Time to be less restrictive

17.10.1.3.2 Time to be more restrictive

17.10.1.3.3 Time between mode changes

17.10.1.3.4 Time of last mode change by left turn

17.10.1.4 Variable lagging left turn splits

17.10.1.4.1 Current value of the calculated left turn split for each left turn

17.10.2 Traffic Responsive Flash

17.10.2.1 Current value of the 15 minute rolling average volumes scaled up to a one hour volume.

17.10.2.1.1 Main street volume

17.10.2.1.2 Minor street approach volume 1

17.10.2.1.3 Minor street approach volume 2

17.10.2.2 Trigger point timers

17.10.2.2.1 Time to be less restrictive

17.10.2.2.2 Time to be more restrictive

17.10.2.2.3 Time between mode changes

17.10.2.3 Current mode of operation

17.10.2.4 Time of last mode change

17.10.3 Cycle-by-Cycle Split Adjustments

17.10.3.1 Current rolling average occupancies for each phase.

17.10.3.2 Current splits for each phase

17.10.3.3 Current percentage of the cycle for each phase

17.10.3.4 Last change in split for each phase

17.10.3.5 Total change in split for each phase

17.10.3.6 Times

17.10.3.6.1 Start of adjustments

17.10.3.6.2 End of adjustments

17.10.4 Auxiliary Field Device Transition Table

17.10.4.1 Current Output

17.10.4.1.1 Default

17.10.4.1.2 Other Output

17.11 INTERSECTION TO VEHICLE INFORMATION

The software shall be capable of providing static and real time information directly to vehicles and to the central system. The vendor shall assist the City in anticipating the information that will be required. The Proposer shall coordinate with On Time Systems (Green Driver) and other emerging Intersection to Vehicle standards so the software provides the needed static and real-time data in the correct format.

17.11.1 Static Information

This information shall be automatically updated when changes are made in the field or the central system database.

17.11.1.1 Is there a right turn signal per direction

17.11.1.2 Are right turns on red permitted per direction

17.11.1.3 Are left turns on red permitted per direction

17.11.1.4 Permitted phases

17.11.1.5 This information shall be provided per permitted phase

17.11.1.5.1 Direction associated with each phase

- The user shall choose from the eight (8) cardinal and intermediate directions.

17.11.1.5.2 Movement associated with each phase

17.11.1.5.3 U-turn, left, through, or right

17.11.1.5.4 Minimum recall

17.11.1.5.5 Maximum recall

17.11.1.5.6 Pedestrian recall

17.11.1.5.7 Walk rest

17.11.1.5.8 Dual entry

17.11.1.5.9 Coordinated phases

17.11.1.5.10 Red lock

17.11.1.5.11 Yellow lock
17.11.1.5.12 Red rest
17.11.1.5.13 Exclusive
17.11.1.5.14 Mode of left turn operation
17.11.1.5.15 Permitted only
17.11.1.5.16 Protected/permitted
17.11.1.5.17 Protected only
17.11.1.5.18 Yellow flash
17.11.1.5.19 Red flash
17.11.1.5.20 Pedestrian walk time
17.11.1.5.21 Pedestrian walk time 2
17.11.1.5.22 Pedestrian clearance
17.11.1.5.23 Pedestrian clearance 2
17.11.1.5.24 Minimum green
17.11.1.5.25 Minimum green 2
17.11.1.5.26 Vehicle Extension
17.11.1.5.27 Maximum green
17.11.1.5.28 Maximum green 2
17.11.1.5.29 Maximum green 3
17.11.1.5.30 Maximum initial
17.11.1.5.31 Time before reduce
17.11.1.5.32 Time to reduce
17.11.1.5.33 Reduce by
17.11.1.5.34 Maximum gap
17.11.1.5.35 Minimum gap
17.11.1.5.36 Yellow clearance
17.11.1.5.37 All-red clearance
17.11.1.5.38 Plan number
17.11.1.5.39 Force Offs
17.11.1.5.40 Splits
17.11.1.5.41 Lagging phases

17.11.2 Real-Time Information

The controller shall be capable of providing the current state of the parameters listed in this section to a vehicle or the central system every second.

17.11.2.1 Time stamp
17.11.2.2 Local cycle timer (top-of-cycle)

17.11.2.3 Current split per phase
- 17.11.2.3.1 Account for variable lagging left turn splits
- 17.11.2.3.2 Account for cycle-by-cycle split adjustments

17.11.2.4 Current mode of left turn operation by phase
- 17.11.2.4.1 Permitted only
- 17.11.2.4.2 Protected/permitted
- 17.11.2.4.3 Protected only

17.11.2.5 Current mode of signal operation
- 17.11.2.5.1 Normal
- 17.11.2.5.2 Yellow flash

17.11.2.6 Green phases
- 17.11.2.6.1 Amount of time in seconds phase will remain green

17.11.2.7 Yellow phases

17.11.2.8 Red phases
- 17.11.2.8.1 Amount of time in seconds phase will remain red

17.11.2.9 Vehicle calls

17.11.2.10 Active pedestrian phases

17.11.2.11 Pedestrian calls
- 17.11.2.11.1 If walk 1 or walk 2 will be provided
- 17.11.2.11.2 If pedestrian clearance 1 or pedestrian clearance 2 will be provided

17.11.2.12 Current state of the overlaps – on/off

17.11.2.13 Active timing plan

17.11.2.14 Communication status (On-line status)

17.11.2.15 Operation status
- 17.11.2.15.1 Normal
- 17.11.2.15.2 Free
- 17.11.2.15.3 Preempt
- 17.11.2.15.4 Transition
- 17.11.2.15.5 All-red flash
- 17.11.2.15.6 Yellow flash

ATTACHMENT 1
APPENDIX A
National Transportation Communication for ITS Protocol (NTCIP) Compliance

1 GENERAL

The local controller software shall comply with all applicable NTCIP standards documents. Compliance shall be to the currently approved or recommended version(s) of the relevant NTCIP standards on the date of the initial acceptance of the software by the Cities.

It is the responsibility of the Offerors to demonstrate to the City's satisfaction that their proposed controller software is in full compliance with the provisions of this Appendix.

The controller must be able to implement all NTCIP messages called for in this Specification without any additional vendor-specific proprietary statements.

1.1 DOCUMENTATION

The software shall be supplied with full documentation. Documentation shall include electronic and hard copy. The electronic copy shall be provided on a CD-ROM. The documentation shall include all NTCIP standard MIBs and extensions, developer-specific MIBs, and all SNMP/STMP data elements. All MIBs shall be provided in American Standard Code for Information Exchange (ASCII) format using ASN.1 notation.

1.2 RE-DISTRIBUTION AND RE-USE RIGHTS

The Offeror shall not place any limitations on the re-distribution and re-use of the MIB. Cities licensed to use the software shall be able to re-distribute and/or re-use the MIBs as required to provide the required functionality defined in this specification.

1.3 MIB EXTENSIONS

The Offeror shall clearly define all MIB extensions. Primarily, all extensions shall be accomplished by the following methods:

1.3.1 Extending the capabilities of existing standard features.

1.3.2 Defining new data elements or features under a developer-specific MIB extension.

To the extent possible, the replacement of a partially complete feature with a complete custom feature shall be avoided.

1.4 SUPPORT OF NTCIP STANDARDS, AMENDMENTS AND REVISIONS

The Offeror shall address any proposed revisions or draft amendments to the required NTCIP MIBs available during the initial procurement stage and the impact on the proposed software's NTCIP compliance and/or ability to meet the functional requirements of this specification. The initial procurement stage shall be extended from the date of release of this specification to one (1) year beyond the initial acceptance of the software by the Cities.

In addition, the Offeror shall provide to the Cities for the life of the software, electronic and hard copies of the MIB whenever changes are made due to changes to the standard, new software features, or bug fixes. The electronic copies shall comply with the requirements in Section 1.1 Backward compatibility is required.

1.5 OBJECT RANGE VALUES

All objects required by these specifications shall support all values within their standardized ranges, unless otherwise approved by the Project Engineer. A size, range, or enumerated listing indicated in the object's SYNTAX field or through descriptive text in the object's DESCRIPTION field of the relevant standard defines the 'standardized range.

The Offeror shall prepare a table of object range values for each object In NTCIP Standards1201 and 1202 and identify any variances from the standard ranges that are required to meet this specification.

2 NTCIP STANDARDS

The Offeror shall define an entre NTCIP stack and identify the NTCIP, or other standards that will be required at each level to meet the specifications contained in this document. For each NTCIP standard, Offerors shall complete a Profile Implementation Conformance Statement (PICS) identifying each required object. All mandatory objects identified in the standards shall be included in the PICS.

As a minimum, the software shall comply with the following standards:

2.1 GENERAL

2.1.1 NTCIP 1101 v01.12 - NTCIP Simple Transportation Management Framework

2.1.1.1 The software shall comply with Conformance Level 2

2.1.2 NCTIP 1102: 2004 – NTCIP Octet Encoding Rules (OER)

2.1.3 NTCIP 1103 v01 - NTCIP Transportation Management Protocols (TMP)

2.1.3.1 The software shall includesupport for the "Simple Fixed Message Protocol" (SFMP)

2.1.4 NTCIP 8004 v01 - NTCIP Structure and Identification of Management Information (SMI)

2.2 INFORMATION LEVEL

2.2.1 NTCIP 1201v03 – NTCIP Global Objects (GO) Definitions

2.2.2 NTCIP 1202:2005 – NTCIP Object Definitions for ASC

2.2.2.1 The software shall fully implement all mandatory objects of all mandatory and optional conformance groups defined in this standard

2.3 APPLICATION LEVEL

2.3.1 NTCIP 2303:2001 v01.06 – NTCIP AP-FTP

2.3.2 NTCIP 2301: v02 - NTCIP AP-STMF

2.4 TRANSPORT LEVEL

2.4.1 NTCIP 2201:2003 - NTCIP TP-Transportation Transport Profile

2.4.2 NTCIP 2202:2001 - NTCIP TP-Internet (TCP/IP and UDP/IP) Transport Profile

2.5 SUBNETWORK LEVEL

2.5.1 NTCIP 2101:2001 - NTCIP SP-PMPP/RS232

2.5.2 NTCIP 2102:2003 – NTCIP SP-PMPP/FSK

2.5.3 NTCIP 2104:2003 – NTCIP SP-Ethernet

Offerors are required to identify and comply with any additional NTCIP or other standards necessary to meet the specifications of this document.

End of Appendix A

ATTACHMENT 1
APPENDIX B
Compliance Matrix

Instructions:

1. Offerors shall provide a response for every requirement.
2. The presented requirements are inclusive of all subheadings and descriptions included in the requirements document. If the proposed software does not comply with all subheadings and descriptions of a particular requirement, the requirement shall be identified as "Partially Meets Requirements" and the Offeror shall specify in the comments area the specific subheadings or descriptions that are not met.

Name of Offeror:_____

Name of Proposed SoftwarePackage:_____

Current Software Version:_____

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
1.0 GENERAL AND ADMINISTRATIVE							
1.2 Intersection Information							
1.2.1 User defined intersection information							
1.3 Controller Information							
1.3.1 Controller information							
1.4 Software Upgrades							
1.4.1 Automatic software upgrade notice							
1.4.2 Remote software download							
1.4.3 Software reside in flash memory							
1.4.4 Software download verification							
1.5 Copy/Paste							
1.5.1 Copy and paste capability							
1.6 Save Changes							
1.6.1 Confirm changes prior to acceptance							
1.6.2 Highlight changes							
1.6.3 Changes activated by confirmation							
1.7 Compatibility with Existing Infrastructure							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
1.7.1 Standard templates for 33x cabinets							
1.7.2 Compatibility with CM/MMU							
1.8 Industry Standard Nomenclature							
1.8.1 Industry standard nomenclature							
1.8.2 Industry standard software development							
1.9 Security							
1.9.1 Password access							
1.9.2 Remote access control							
1.10 Web Browser							
1.10.1 Controller resident web server							
1.10.2 Web user interface object support							
1.10.3 Status objects							
1.10.4 Web server Mib parameters							
1.11 Daylight Savings Time							
1.11.1 Daylight savings time programmability							
1.11.2 DST default enabled							
2.0 CONFIGURATION							
2.1 Configuration Tables							
2.1.1 Multiple configuration tables							
2.2 Cabinet Configuration							
2.2.1 Selectable cabinet type							
2.2.2 Configurable channels for maximum ITS cabinet							
2.2.3 User definable input pins – 128							
2.2.4 User definable output pins – 128							
2.2.5 Redirect outputs based on pin assignment							
2.3 Ring Barrier Configuration							
2.3.1 Programmable ring barrier structure							
2.3.2 Minimum eight rings and 12 barriers							
2.3.3 One instance of phase in ring barrier sequence							
2.3.4 Ability to alter ring barrier structure while running intersection							
2.4 Start-up Configuration							
2.4.1 Configurable initial operation							
2.4.2 Start-up parameter configuration							
2.4.3 Start-up parameter timing							
2.5 Programmed Flash Operation							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
2.5.1 Programmable flash operation							
2.5.2 Enter program flash after all red							
2.5.3 Minimum recalls entering flash operation							
2.5.4 End programmed flash							
2.5.5 Programmed flash parameters							
2.6 Manual Control Configuration							
2.6.1 Manual control alternate sequence							
2.6.2 Manual control disable							
3.0 DETECTION							
3.1 General							
3.1.1 Vehicle detectors							
3.1.2 Pedestrian detectors							
3.1.3 System detectors							
3.1.4 Queue detectors							
3.1.5 Description field							
3.1.6 Four unique detector tables							
3.2 Global Detector Parameters							
3.2.1 Detection parameters							
3.3 Detector Configuration							
3.3.1 Detector type selection							
3.4 Vehicle Detector Configuration							
3.4.1 Vehicle detector configuration							
3.4.2 Vehicle detector parameters							
3.5 Pedestrian Detector Configuration							
3.5.1 Pedestrian detector configuration							
3.6 System/Count Detector Configuration							
3.6.1 All detectors function as system detectors							
3.6 Detector Input Failure							
3.7.1 Detector failure alarm							
3.7.2 Automated response to detector failure							
3.73. Detector failure modes							
3.9 Remote Reset							
3.8.1 Remote reset capability							
4.0 PHASE PARAMETERS							
4.1 General							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
4.1.1 Minimum 32 vehicular phases							
4.1.2 Minimum 12 pedestrian phases							
4.1.3 Phase changes become active at beginning of local cycle							
4.1.4 Pedestrian hybrid beacon operation capability							
4.2 Multiple Phase Parameters Tables							
4.2.1 Minimum 32 phase parameter tables							
4.3 Phase Configuration							
4.3.1 Phase configuration							
4.4 Phase Timing Parameters							
4.4.1 Phase timing parameter ranges							
4.4.2 Phase timing parameters							
4.5 Global Phase Parameters							
4.5.1 Global phase parameters always active							
4.5.2 Global phase parameters							
4.6 Pedestrian Operation							
4.6.1 Pedestrian movements on any pedestrian channel							
4.6.2 Pedestrian channels assignable to phase							
4.6.3 Pedestrian call operation							
4.6.4 Alternative pedestrian interval							
4.6.5 Immediate pedestrian clearance on preempt							
4.6.6 Exclusive pedestrian service							
4.6.7 Walk rest operation							
4.6.8 Barnes' Dance interval							
4.6.9 Number of pedestrian services per call definable							
4.7 Left Turn Operation							
4.7.1 Variable left turn operation by time of day/day of week							
4.7.2 Variable left turn operation within plan							
4.7.3 Left turn indications supported							
4.7.4 Five section head operation							
4.8 Right Turn Operation							
4.8.1 Variable right turn operation by time of day/day of week							
4.8.2 Variable right turn operation within plan							
4.8.3 Right turn indications supported							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
4.8.4 Right turn / pedestrian operation							
4.9 Pedestrian Hybrid Beacon Operation							
4.9.1 Pedestrian hybrid beacon functionality							
4.9.2 Pedestrian hybrid beacon indications							
4.9.3 Pedestrian hybrid beacon operation							
4.9.4 Pedestrian hybrid beacon system operation							
4.10 Phase Sequence							
4.10.1 Phase sequence general							
4.10.2 Pre-signal sequence							
5.0 OVERLAPS							
5.1 General							
5.1.1 Minimum 20 overlaps							
5.1.2 User definable text label for each overlap							
5.1.3 Templates for overlaps							
5.1.4 Minimum eight distinct overlap tables							
5.2 Overlap Configuration							
5.2.1 Overlap configuration settings							
5.3 Overlap Timing Parameters							
5.3.1 Overlap minimum green							
5.3.2 Overlap green extension							
5.3.3 Overlap green clear 1							
5.3.4 Overlap yellow clearance							
5.3.5 Overlap red clearance							
5.3.6 Overlap pedestrian walk 1							
5.3.7 Overlap pedestrian walk 2							
5.3.8 Overlap pedestrian clearance 1							
5.3.9 Overlap pedestrian clearance 2							
5.3.10 Overlap reservice							
5.4 Overlap Operation							
5.4.1 Right turn arrow overlap with pedestrian service operation							
5.4.2 Pre-signal overlap operation							
5.4.3 Pedestrian overlap operation							
6.0 SCHEDULE							
6.1 General							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
6.1.1 Schedule types							
6.1.2 Automatic schedule sort in chronological order							
6.1.3 Enable/disable function							
6.1.4 Completely define operation							
6.1.5 Log schedule events							
6.1.6 Schedule event priority							
6.2 Time of Day. Day of Week Schedule							
6.2.1 Minimum 32 events per schedule							
6.2.2 Minimum 16 distinct schedules							
6.2.3 Schedule operational modes							
6.2.4 Schedule defined parameters							
6.3 Holiday Schedule							
6.3.1 Fixed and floating holiday functionality							
6.3.2 Schedule events minimum one year in advance							
6.3.3 Schedule events five days on either side of holiday							
6.3.4 Sort schedule by month and day							
6.3.5 Schedule user defined parameters							
6.4 Seasonal Schedule							
6.4.1 Minimum 10 seasonal events							
6.4.2 Schedule seasonal events minimum one year in advance							
6.4.3 Seasonal schedule parameters							
6.5 Temporary Schedule							
6.5.1 Schedule expiration date for events							
6.5.2 Revert to scheduled event after expiration							
6.5.3 Minimum of four temporary schedule events							
6.5.4 Temporary operational modes							
6.5.5 User define deletion of event upon expiration							
6.5.6 Temporary schedule parameters							
7.0 COORDINATION							
7.1 General							
7.1.1 Minimum 32 locally stored timing plan sets							
7.1.2 Coordinator startup after startup phases serviced							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
7.1.3 Parameter changes activated at beginning of cycle							
7.1.4 Detector and overlap changes activated at new timing plan							
7.1.5 User defined offset reference point							
7.2 Coordination Parameters							
7.2.1 Coordination parameters							
7.3 Pedestrian Service							
7.3.1 Pedestrian service operation							
7.3.2 Pedestrian adjust							
7.3.3 Pedestrian phase end early operation							
7.3.4 Pedestrian phase call during clearance							
7.3.5 Pedestrian phase call recognition for long pedestrian service							
7.3.6 Pedestrian phase call recognition for short pedestrian service							
7.4 Pedestrian Service Parameters							
7.4.1 Pedestrian adjust enable							
7.4.2 Time for pedestrian service taken from preceding phase							
7.4.3 Time for pedestrian service taken from subsequent phase							
7.5 Coordinated Operation (Use Cases)							
7.5.1 Recycle left turn operation							
7.5.2 Back up into leading left turn operation							
7.5.3 Optional leading left turn operation							
7.5.4 Double service for side street operation							
7.5.5 Free mode operation within coordination operation							
7.5.6 Optional lagging left turn operation							
7.5.7 Phase recycle with split phase operation							
7.5.8 Optional service with split phase operation							
8.0 PREEMPTION							
8.1 General							
8.1.1 Minimum 12 programmable preemption sequences							
8.1.2 Preempt types							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
8.1.3 Programmable for railroad and emergency vehicle							
8.1.4 Preempt labels							
8.1.5 Delay preempt input							
8.1.6 Smooth transition from one preempt to another							
8.1.7 Preempt inputs available as logic identifiers							
8.1.8 Ability to activate auxiliary devices as part of preempt							
8.1.9 Automatic reset of maximum timer							
8.1.10 Recycle entry phases prohibited							
8.1.11 Recycle return phases prohibited							
8.1.12 Active plan continue to run in background during preempt							
8.1.13 Preempt input ability to change mode of operation							
8.1.14 Multiple preempt exit options							
8.2 Preempt States							
8.2.1 Preempt states							
8.3 Preemption Priority							
8.3.1 Preemption priority							
8.3.2 User defined priority							
8.3.3 Railroad defined as high priority							
8.3.4 Emergency vehicle preemption prohibited from higher priority than rail.							
8.3.5 Emergency vehicle preemption defined as lowest preempt priority							
8.3.6 High priority preempts override low priority preempts							
8.3.7 Low priority preempts ignored during high priority preempt activity							
8.3.8 Equal priority preempts served in order calls received							
8.4 Railroad Preemption							
8.4.1 Railroad preempt configuration							
8.4.2 Four unique inputs for railroad preemption							
8.4.3 Preemption provided during flash operation							
8.4.4 Entry phases not terminated until gate down input received							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
8.4.5 Flash operation allowed during dwell interval							
8.5 Emergency Vehicle Preemption							
8.5.1 Emergency vehicle preemption (EVP) types							
8.5.2 Minimum six inputs for EVP							
8.5.3 Hold phases remain active until call ends or max time							
8.5.4 EVP service based on traffic demand							
8.6 Normal Preempt Configuration							
8.6.1 Preemption configuration settings							
8.6.2 Preemption timing parameters							
9.0 TRANSIT PRIORITY							
9.1 General							
9.1.1 Software shall run transit signal displays							
9.1.2 Transit signal display parameters							
9.1.3 Transit signal display synchronized with compatible vehicle and pedestrian phases							
9.1.4 Three levels of priority operation							
9.1.5 Higher priority services override lower priority services							
9.1.6 Lower priority services ignored until higher priority services terminate							
9.1.7 Equal priority services served in order calls received							
9.2 Full Priority Operation							
9.2.1 Full transit priority for median running trains							
9.2.2 Exclusive train phase functionality							
9.2.3 Transit priority operational during programmed flash							
9.2.4 Full priority termination sequence							
9.2.5 Priority events logged							
9.3 Partial Transit Priority							
9.3.1 Partial transit priority functionality							
9.3.2 Partial transit priority configuration							
9.3.3 Partial priority timing parameters							
9.3.4 Partial priority operation							
9.4 Bus Priority							
9.4.1 Bus priority functionality							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
9.4.2 Bus priority configuration							
9.4.3 Bus priority timing							
9.4.4 Bus priority operation							
10.0 ADVANCED PROGRAMMING							
10.1 General							
10.1.1 Minimum 64 user definable logic commands							
10.1.2 No limitation to logic statement linkages							
10.1.3 Logic commands							
10.1.4 Logic command functions							
10.2 Assignable Outputs							
10.2.1 Available assignable outputs							
10.3 Assignable Inputs							
10.3.1 Available assignable inputs							
11.0 COMMUNICATIONS							
11.1 General							
11.1.1 External communication support							
11.1.2 Simultaneous communication							
11.1.3 Communication methods supported							
11.1.4 Support half and full duplex							
11.1.5 ARP packet transmission upon connection to Ethernet							
11.1.6 Ability to extract VLANS							
11.2 Center to Field Communications							
11.2.1 Front panel capability for upload/download with central							
11.2.2 Supported communication patterns							
11.2.3 Center to Field communication interfaces							
11.2.4 Configurable field to central communication							
11.2.5 Capability for field to central over 10/100 Ethernet network							
11.2.6 Capability for field to central over serial network							
11.3 Peer to Peer Communications							
11.3.1 Peer to peer communication support							
11.3.2 Peer to peer over Ethernet network							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
11.3.3 Transmission and reception of multiple messages simultaneously							
11.3.4 Transmit to minimum five peers							
11.3.5 Receive from minimum five peers							
11.3.6 Peer intersections user selectable							
11.3.7 Receipt of peer message apply local internal control							
11.3.8 Definable time out communication feature							
11.3.9 Failure of peer communication generates alarm							
11.4 Local Wireless Remote							
11.4.1 Remote local access methods							
11.4.2 Minimum remote access range of 200 feet							
11.4.3 Secure data transmission for remote access							
11.4.4 Remote access devices							
11.4.5 Local remote support bandwidth							
ADVANCED OPERATIONS							
12.1 Traffic Responsive Operation							
12.1.1 Traffic responsive parameters							
12.1.2 Traffic responsive operation for defined group							
12.2Queue Detection							
12.2.1 Minimum eight independent queue detectors per intersection							
12.2.2 Programmable by time of day/day of week							
12.2.3 Detector failure will disable queue response							
12.2.4 Minimum four levels of priority							
12.2.5 Queue detector configuration settings							
12.2.6 Left or through queue detector settings							
12.2.7 Partial priority queue detection							
12.2.8 Diamond intersection queue detection							
12.2.9 Logged events							
12.2.10 Detector failures logged							
12.3Auxiliary Field Device Operation							
12.3.1 Auxiliary field device operation							
12.3.2 Minimum eight independent auxiliary devices							
12.3.3 Minimum four independent auxiliary device tables							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
12.3.4 Auxiliary device table activation							
12.3.5 Auxiliary device output states							
12.3.6 Repeat states							
12.3.7 Change to device state generators							
13.0 DIAMOND INTERCHANGE SEQUENCE							
13.1 General							
13.1.1 Sequence approved by City							
13.1.2 Sequence types supported							
13.1.3 Functionality as actuated, semi-actuated and fixed time							
13.1.4 Smooth transition between sequences							
13.1.5 Sequences support right turn overlaps							
13.1.6 Sequences support eight active pedestrian channels							
13.1.7 Templates provided							
13.2 Diamond Interchange K-Clearance							
13.2.1 General requirements of K clearance							
13.2.2 Figure 3 diamond sequence operation							
13.2.3 Figure 6 or 7 diamond sequence operation							
13.2.4 Figure 4 diamond sequence operation							
14.0 LOGS							
14.1 General							
14.1.1 All log entries time stamped in military time							
14.1.2 All log entries available from front panel and central							
14.1.3 Minimum log storage of seven days of events							
14.1.4 Oldest entries overwritten when log full							
14.2 General Controller Log							
14.2.1 Power loss log							
14.2.2 External start log							
14.2.3 Manual control log							
14.2.4 Cabinet door log							
14.3 Conflict Monitor/MMU Log							
14.3.1 Conflict monitor / MMU log							
14.4 Front Panel Log							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
14.4.1 Front panel modification log							
14.4.2 User log							
14.5 Controller Software Log							
14.5.1 All events and actions logged daily							
14.6 Detector Log							
14.6.1 Detector diagnostics log							
14.7 Vehicle Split Log							
14.7.1 Vehicle split time log							
14.8 Cycle Time Log							
14.8.1 Cycle time log during free operation							
14.8.2 Cycle time log during coordinated operation							
14.9 Coordination log							
14.9.1 Coordination log							
14.10 Preempt Log							
14.10.1 Preempt log							
14.11 Transit Priority Log							
14.11.1 Transit priority log							
14.12 Special Event Log							
14.12.1 Special event log							
14.13 Advanced Operation Event Log							
14.13.1 Advanced operation log							
15.0 USER INTERFACE							
15.1General							
15.1.1 User interface for data entry, monitoring and management							
15.1.2 Accessible from front panel or remote device							
15.1.3 Unused parameters not displayed							
15.1.4 Menu driven format							
15.1.5 All programming downloadable to remote or central							
15.1.6 On-screen help provided							
15.2 Data Entry							
15.2.1 Menu format, in English, using standard nomenclature							
15.2.2 Menu format with submenus							
15.2.3 Titles and headings remain visible during scrolling							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
15.2.4 Easy of navigation							
15.2.5 Data changes highlighted until saved							
15.2.6 Entries unavailable based on security omitted or obscured							
15.3 Status Display							
15.3.1 Real time status availability							
15.3.2 Real time status displays							
15.3.3 Controller status detail							
15.3.4 Ring status detail							
15.3.5 Phase status detail							
15.3.6 Coordination status detail							
15.3.7 Preemption status detail							
15.3.8 Overlap status detail							
15.3.9 Detector status detail							
15.3.10 Communication status detail							
15.3.11 Cabinet status detail							
15.3.12 Advanced operation status detail							
16.0 MISCELLANEOUS							
16.1 Special Function/Time of Day Outputs							
16.1.1 Minimum ten special function outputs							
16.1.2 Special function activation							
16.1.3 Special function status							
16.2 Alarms							
16.2.1 Minimum 48 predefined alarms							
16.2.2 Alarms logged							
16.2.3 Alarm messages to central configurable							
16.2.4 Any physical input has alarm functionality							
16.2.5 Alarm classification types							
16.2.6 Critical alarm types							
16.2.7 Non-critical alarm types							
16.2.8 Coordination alarm types							
16.2.9 Communication alarms							
16.2.10 Preempt alarms							
16.2.11 Priority alarms							
16.3 Diagnostics							
16.3.1 Diagnostic support							
16.4 Timing Sheets							

Local Traffic Signal Controller Software Minimum Requirements Compliance Matrix							
Minimum Requirements	Meets Requirement	Exceeds Requirement	Partially Meets Requirements	Operating in Field	Requirement in Development	Function not available	Comments or Footnotes
16.4.1 Timing sheet availability							
16.4.2 Timing sheets uploadable to central or remote device							
ADDITIONAL FUNCTIONALITY INLCUDED IN PROPOSED SOFTARE (DESCRIBE)							

End of Appendix B

ATTACHMENT 1
APPENDIX C
Sample Timesheets

INTERSECTION: HARRY HINES–MEDICAL DISTRICT DATE: 2010–Sep–03 PAGE 1 of 5

PAGE=F/1 PHASE BANK 1

	DESCRIPTION	1 NBLT	2 SB	3 EBLT	4 WB	5 SBLT	6 NB	7 WBLT	8 EB
0	MINIMUM GREEN	7	14	3	6	3	14	3	6
1	VEH EXTENTION	1.0	3.5	2.5	2.0	3.0	3.5	1.5	2.0
2	TIME BEF DET DISABLE	0	0	0	0	0	0	0	0
3	MAXIMUM GREEN 1	20	60	25	35	30	60	20	40
D 4	MAXIMUM GREEN 2	13	25	10	20	10	25	10	20
/| 5	YELLOW CHANGE	3.0	4.5	3.0	4.0	3.0	4.5	3.0	4.0
| 6	ALL RED CLEARANCE	2.0	1.0	2.0	1.8	2.0	1.0	2.0	1.8
| 7	WALK	0	4	0	4	0	4	0	4
\/| 8	FLASHING DONT WALK	0	14	0	16	0	14	0	16
A 9	ADVANCE DELAY WALK	0	0	0	0	0	0	0	0
	A VOL DEN–ADD PER VEH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	B VOL DEN–MAX INITIAL	0	0	0	0	0	0	0	0
	C VOL DEN–MIN GAP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	D VOL DEN–MAX GAP	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E VOL DEN–REDUCE EVERY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	F CALL PHASE TO FOLLOW	0	0	0	0	0	0	0	0

PAGE= E/29 OVERLAPS

	DESCRIPTION	1 NBLLT	2 SBLLT	3 EBLLT	4 WBLLT	5	6	7	8
0	MONITOR CHANNEL	9	10	11	12	0	0	0	0
1	VEH SET 1 PHS	126	256	348	478				
D 2	VEH SET 2 PHS	126	256	348	478				
/| 3	VEH SET 3 PHS	126	256	348	478				
| 4	NEGATIVE VEH PHS	5	1	7	3				
| 5	NEGATIVE PED PHS								
\/| 6	NEGATIVE OVERLAPS								
A 7	INHIBIT NEG VEH PHS	1	5	3	7				
	8 GREEN OMIT (RTOL'S)								
	9 GREEN CLEAR OMIT								
	A OVERLAP SUPPRESION PHS								
	D GREEN CLEAR TIME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E YELLOW TIME	3.0	3.0	3.0	3.0	0.0	0.0	0.0	0.0
	F RED TIME	2.0	2.0	2.0	2.0	0.0	0.0	0.0	0.0

PAGE=E/127 REDIRECT OUTPUTS

		1	2	3	4	5	6	7	8
0	WALK	0	0	0	0	0	0	0	0
1	DONT WALK	0	0	0	0	0	0	0	0
2	PHASE GREEN	0	0	0	0	0	0	0	0
3	PHASE YELLOW	0	0	0	0	0	0	0	0
4	PHASE RED	0	0	0	0	0	0	0	0
5	OVERLAP GREEN	0	0	0	0	0	0	0	0
6	OVERLAP YELLOW	0	0	0	0	0	0	0	0
7	OVERLAP RED	0	0	0	0	0	0	0	0

BITRAN 255

C <------> F

PAGE=F/11+COL+ROW

		A	B	C	D
0	N/U				
1	PH 1	0	0	0	0.0
2	PH 2	0	0	0	0.0
3	PH 3	0	0	0	0.0
4	PH 4	0	0	0	0.0
5	PH 5	0	0	0	0.0
6	PH 6	0	0	0	0.0
7	PH 7	0	0	0	0.0
8	PH 8	0	0	0	0.0
	COND. SERV. MIN				
	ALT. WALK				
	ALT. FDW				
	ALT. INITIAL				
	ALT. EXTENSION				
	REASON FOR TERMINATION				
	4 = PHASE MAXED OUT				
	5 = PHASE GAPPED OUT				
	F = PHASE FORCED OFF				

NOTE: PROGAMMABLE ONLY BY KEYBOARD

PAGE=C/0 + COL + ROW

0	COMMUNICATIONS ADDRESS	93
1	ZONE NUMBER	
2	AREA ESCORT LINE) NUMBER	1
3	AREA ADDRESS	
4	IDENTIFICATION NUMBER 1+XXX	
5	SEND LOCAL DATA TO CENTRAL	
6	SEND CENTRAL DATA TO LOCAL	
7	REQUEST TIMESHEET PRINTOUT	
8		
9		

PAGE=E/125 + COL + ROW

		B
0	ALL RED START TIME	5.0
1	START UP YEL TIME	4.0
2	PVR CYC COR. LONG FAIL TIME	0.7
3	PVR CYC COR. SHORT FAIL TIME	0.7
4	MIN PREEMPT INPUT TIME	0.5
5	RED REVERT TIME	2.0
6	9 WIRE SYNC TIME	3.0
7		
8		
9		

PAGE=E/125+COL+ROW

		E
0	PERMITTED PHS	12345678
1	LAG FSET 0 PHS	2468
2	EXCLUSIVE PHS	
3	EXCLUSIVE PED PHS	
4	RESTRICTED PHS	
5	DIAMOND SEQ. FSET 0	
6	PHS TO OUTPUT PED2	2
7	PHS TO OUTPUT PED6	6
8	PHS TO OUTPUT PED4	4
9	PHS TO OUTPUT PED8	8
A	LAST PHS BEFORE FLSH	
B	DELAY WALK PHS	
C	FLASH YELLOW PHS	
D	FLASH YEL OVERLAPS	
E	EXTRA	
F	IC SELECT	4

PAGE=F/11+COL+ROW

		Time	EV PH ASSIGNMENTS	LEDS F
0	MAX PREEMPT TIME	0	0 DISPLAY ACTIVE PREEMPT	READ
1	MIN/PED CLEAR TIME	0	1 PREMPT FROM FLSH(1–8)	
2	EVA (1) DELAY TIME	0	2 EVA (1) CLEAR PHS	
3	EVA (1) CLEAR TIME	0	3 EVA (1) CLR OVERLAPS	
4	EVB (2) DELAY TIME	0	4 EVB (2) CLEAR PHS	
5	EVB (2) CLEAR TIME	0	5 EVB (2) CLR OVERLAPS	
6	EVC (3) DELAY TIME	0	6 EVC (3) CLEAR PHS	
7	EVC (3) CLEAR TIME	0	7 EVC (3) CLR OVERLAPS	
8	EVD (4) DELAY TIME	0	8 EVD (4) CLEAR PHS	
9	EVD (4) CLEAR TIME	0	9 EVD (4) CLR OVERLAPS	
A	RR1 (5) DELAY TIME	0	A RR1 (5) CLEAR PHS	
B	RR1 (5) CLEAR TIME	0	B RR1 (5) CLR OVERLAPS	
C	RR2 (6) DELAY TIME	0	C RR2 (6) CLEAR PHS	
D	RR2 (6) CLEAR TIME	0	D RR2 (6) CLR OVERLAPS	
E	DISPLAY CLEAR TIME	READ	E RR2 (6) LTD SERVICE PHS	
F	DISPLAY DELAY TIME	READ	F RR RETURN PHS	

FUNCTION SET 0

PAGE=E/125 +COL+ROW

		F
0	START–UP YELLOW PHS	48
1	FIRST PHASES	25
2	OVERRIDE MIN RECALL	1357
3	OVERRIDE MAX RECALL	2468
4	OVERRIDE PED RECALL	
5	OVERRIDE DUAL ENTRY	2468
6	LOCK VEH CALL ON YEL	
7	LOCK VEH CALL ON RED	5
8	CONDITIONAL SERVICE	
9	WALK REST	
A	SIMULTANEOUS GAP	26
B	VOL DEN–GLIAR PASS	
C	SOFT RECALL	
D	RED REST	
E	START VEHICLE CALLS	12345678
F	START PED CALLS	2468

IC SELECT

LED 1	LED 1–TBC SYNC 8/0+9 EXTRA
LED 2	LED 2–NEMA EXTERNAL COORD
LED 3	LED 3–DAYLIGHT SAVINGS
LED 4	LED 4–EV ADVANCE
LED 5	LED 5–EXP STATUS REPORTING
LED 6	LED 6–INTERNATIONAL PED
LED 7	LED 7–DISABLE MIN YEL
LED 8	LED 8–SPLIT RING

LED 1 LED 2–TWO WAY MODEM
LED 3–NINE WIRE SLAVE
LED 4
LED 5
LED 6–
LED 7–NINE WIRE MASTER
LED 8–OFFSET INTERUPT

Form Rev. 8/22/95

INTERSECTION: HARRY HINES–MEDICAL DISTRICT **DATE: 2010–Sep–03**

PAGE–C/1 • COL•ROW

		1	2	3	4	5	6	7	8	9	A/10	B/11	C/12	D/13	E/14	F/15
	COORD PLANS	OFFPEAK	AM PEAK	PM PEAK	WKEND											
0	LATCH FORCE OFF 1	61	0	62	51	0	0	0	0	0	0	0	0	0	0	0
1	LATCH FORCE OFF 2	0	98	0	0	0	0	0	0	0	0	0	0	0	0	0
2	LATCH FORCE OFF 3	23	51	48	38	0	0	0	0	0	0	0	0	0	0	0
3	LATCH FORCE OFF 4	45	27	22	27	0	0	0	0	0	0	0	0	0	0	0
4	LATCH FORCE OFF 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	LATCH FORCE OFF 6	82	107	147	64	0	0	0	0	0	0	0	0	0	0	0
6	LATCH FORCE OFF 7	13	12	15	11	0	0	0	0	0	0	0	0	0	0	0
7	LATCH FORCE OFF 8	45	51	48	38	0	0	0	0	0	0	0	0	0	0	0
8	PERM START 1	38	46	42	33	0	0	0	0	0	0	0	0	0	0	0
9	PERM START 2	38	46	42	33	0	0	0	0	0	0	0	0	0	0	0
A	PERM START 3	0	21	21	14	0	0	0	0	0	0	0	0	0	0	0
B	PERM START 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C	PERM START 5	82	46	147	64	0	0	0	0	0	0	0	0	0	0	0
D	PERM START 6	38	46	42	33	0	0	0	0	0	0	0	0	0	0	0
E	PERM START 7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	PERM START 8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PAGE–C/2 • COL•ROW

		1	2	3	4	5	6	7	8	9	A/10	B/11	C/12	D/13	E/14	F/15
	COORD PLANS	OFFPEAK	AM PEAK	PM PEAK	WKEND											
0	CYCLE LENGTH	96	120	160	75	0	0	0	0	0	0	0	0	0	0	0
1	OFFSET A/1	2	117	103	1	0	0	0	0	0	0	0	0	0	0	0
D 2	OFFSET B/2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
/| 3	OFFSET C/3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I 4	SPL RING OFFSET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I 5	PED ADJUST	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0
\/| 6	INHIBIT MAX (PHS)															
A 7	TRANS TYPE (X.Y)*	0.3	0.3	0.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	NON–LATCH O. 1	61	73	62	51	0	0	0	0	0	0	0	0	0	0	0
9	NON–LATCH O. 2	0	98	0	0	0	0	0	0	0	0	0	0	0	0	0
A	NON–LATCH O. 3	23	51	48	38	0	0	0	0	0	0	0	0	0	0	0
B	NON–LATCH O. 4	45	27	22	27	0	0	0	0	0	0	0	0	0	0	0
C	NON–LATCH O. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	NON–LATCH O. 6	82	107	147	64	0	0	0	0	0	0	0	0	0	0	0
E	NON–LATCH O. 7	13	12	15	11	0	0	0	0	0	0	0	0	0	0	0
F	NON–LATCH O. 8	45	51	48	38	0	0	0	0	0	0	0	0	0	0	0

PAGE–E/18

	FUNCTION SETS	FSET 1 COL 1	FSET 2 COL 2	FSET 3 COL 3	FSET 4 COL 4	FSET 5 COL 5	FSET 6 COL 6	FSET 7 COL 7	FSET 8 COL 8
0	MIN RECALL								
1	MAX RECALL	1337	12357	12357					
2	PED RECALL								
3	DMIT PHS								
4	LAG PHS	2458	2358	2358	2358				
5	EXCLUSIVE								
6	COND SERV								
7	EVERY OTHER								
8	NO PED DMT	4	48	48					
9	CALC WALK								
A	MAX GREEN 2								
B	OVERLAP SET	1	1	1	1				
C	PH BANK	1	1	1	1				
D	DETECTOR ST	1	1	1					
E	BITS 1–8*								
F	TOD OUTPUTS								

PAGE–E/18

	FUNCTION SETS	FSET 5 COL 5	FSET 6 COL 6	FSET 7 COL 7	FSET 8 COL 8
0	MIN RECALL				
1	MAX RECALL				
2	PED RECALL				
3	OMIT PHS			1357	
4	LAG PHS				2468
5	EXCLUSIVE				
6	COND SERV				
7	EVERY OTHER				
8	NO PED OMIT				
9	CALC WALK				
A	MAX GREEN 2				
B	OVERLAP SET				
C	PH BANK			1	
D	DETECTOR ST				1
E	BITS 1–8*				
F	TOD OUTPUTS				

PAGE 2 OF 5

* SEE FSET BITS PAGE 3 OF 5

C <–> F * X.1=DWELL ONLY 0=SHORTWAY Y= # OF CYCLES

BITRAN 255

Form Rev: 7/1993

INTERSECTION: HARRY HINES–MEDICAL DISTRICT DATE: 2010–Sep–03 PAGE 3 OF 5

PAGE –9 /0.1

DAY SCHEDULE

	TIME	PLN	OFF	DAY(S) (LED)	SEASON	FSET
0	0:00	4	A	+E	1234567	C<–>F
1	5:30	1	A	+E	23456	C<–>F
2	8:00	2	A	+E	23456	C<–>F
D 3	9:00	1	A	+E	23456	C<–>F
/1\ 4	15:00	3	A	+E	23456	C<–>F
I 5	18:30	1	A	+E	23456	C<–>F
I 6	20:00	4	A	+E	23456	C<–>F
\W/ 7	0:00	0		+E		C<–>F
A 8	0:00	0		+E		C<–>F
9	0:00	0		+E		C<–>F
A	0:00	0		+E		C<–>F
B	0:00	0		+E		C<–>F
C	0:00	0		+E		C<–>F
D	0:00	0		+E		C<–>F
E	0:00	0		+E		C<–>F
F	0:00	0		+E		C<–>F

SPECIAL EVENT / HOLIDAY DATES

PAGE –9 /1.1 (OTHER PAGE ON 6 OF 6)

	DAY	YR	MON	DAY/EVENT #	REP	WDW/DOW
0	1	0	1	7	C<–>F	1
1	0	0	5	7	C<–>F	1
2	4	0	7	7	C<–>F	1
3	0	0	9	7	C<–>F	1
4	0	0	11	7	C<–>F	1
5	0	0	11	7	C<–>F	1
6	25	0	12	7	C<–>F	1
7	0	0	0		C<–>F	0
8	0	0	8	1	C<–>F	1
9	0	0	8	68	C<–>F	1
A	0	0	8	1	C<–>F	1
B	0	0	8	78	C<–>F	1
C	0	0	0		C<–>F	0
D	0	0	0		C<–>F	0
E	0	0	0		C<–>F	0
F	0	0	0		C<–>F	0

From Rec 8/23/03

BITRAN 255

DAY SCHEDULE

	TIME	PLN	OFF	DAYS (LED)	SEASON	FSET
0	0:00	0		+E	C<–>F	0
1	0:00	0		+E	C<–>F	0
2	0:00	0		+E	C<–>F	0
3	0:00	0		+E	C<–>F	0
D 4	0:00	0		+E	C<–>F	0
/1\ 5	0:00	0		+E	C<–>F	0
I 6	0:00	0		+E	C<–>F	0
I 7	0:00	0		+E	C<–>F	0
\W/ 8	0:00	0		+E	C<–>F	0
A 9	0:00	0		+E	C<–>F	0
A	0:00	0		+E	C<–>F	0
B	0:00	0		+E	C<–>F	0
C	0:00	0		+E	C<–>F	0
D	0:00	0		+E	C<–>F	0
E	0:00	0		+E	C<–>F	0
F	0:00	0		+E	C<–>F	0

SPECIAL EVENT / HOLIDAY SCHEDULE

PAGE –9 /1.1 (OTHER PAGE ON 6 OF 6)

	TIME	PLN	OFF	EVENT #	FSET
0	0:00	0		C<–>F+ 0	0
1	0:00	0		C<–>F+ 0	0
2	0:00	0		C<–>F+ 0	0
3	0:00	0		C<–>F+ 0	0
D 4	0:00	0		C<–>F+ 0	0
/1\ 5	0:00	0		C<–>F+ 0	0
I 6	0:00	0		C<–>F+ 0	0
I 7	0:00	0		C<–>F+ 0	0
\W/ 8	0:00	0		C<–>F+ 0	0
A 9	0:00	0		C<–>F+ 0	0
A	0:00	0		C<–>F+ 0	0
B	0:00	0		C<–>F+ 0	0
C	0:00	0		C<–>F+ 0	0
D	0:00	0		C<–>F+ 0	0
E	0:00	0		C<–>F+ 0	0
F	0:00	0		C<–>F+ 0	0

PLAN

FREE PLAN=E OFFSET=E

FLASH YR PLAN=F OFF=F

FLASH R/Y PLAN=F OFF=0

A=PLAN 10 B=PLAN 11

C=PLAN 12 D=PLAN 13

E=PLAN 14 F=PLAN 15

OFFSET

0=R/Y FLASH F=Y/R FLASH

A=OFFSET 1 B=OFFSET 2

C=OFFSET 3

DAYS (LEDS)

WEEK DAYS 1–7 SUNDAY=1

SEASON

1=SEASON 1 2=SEASON 2

3=BOTH

FSET (FUNCTION SET 1–8)

SPECIAL/HOLIDAY DATE

MONTH

1=JAN–SEPT

A=OCT B=NOV C=DEC

DAY/EVENT #

TURN LED 8 ON + EVENT #=1–8

OR = 6 TO BEGIN SEASON 1

OR = 7 TO BEGIN SEASON 2

REP=REPEATING YEAR

1=REPEAT 0=NON REPEAT

WDW & DOW

WDW & DOW ENABLED

WHEN DAY OF MONTH = 0

FUNCTION SET BITS

1–LOCAL OVERRIDE

2–UNDEFINED

3–UNDEFINED

4–DIGAN DETECTOR MONITR OFF

5–UNDEFINED

6–UNDEFINED

7–DETECTOR COUNT MONTH ON

8–UNDEFINED

MINIMUM GRN + YEL + RED

CALC. OF MIN. CYC. LGH

PAGE–0/9

	COL 2
0	
1	TRANS MIN PH 1
2	TRANS MIN PH 2
3	TRANS MIN PH 3
4	TRANS MIN PH 4
5	TRANS MIN PH 5
6	TRANS MIN PH 6
7	TRANS MIN PH 7
8	TRANS MIN PH 8
9	
A	
B	
C	
D	
E	
F	

10	
21	
10	
27	
10	
21	
10	
27	

FSET FOR MANUALED OR COMMANDED PLAN

PAGE–0/9

	COL 3
0	PLAN 345 FSET
1	PLAN 1/6 FSET
2	PLAN 2/7 FSET
3	PLAN 3/8 FSET
4	PLAN 4/9 FSET
5	PLAN 5/A FSET
6	PLAN 6/B FSET
7	PLAN 7/C FSET
8	PLAN 8/D FSET
9	PLAN 9/E FSET
A	PLAN A/1/2/3 FSET
B	PLAN B/1/1/5 FSET
C	PLAN C/1/2/5 FSET
D	PLAN D/1/3/5 FSET
E	PLAN E/1/4/5 FSET
F	PLAN F/1/5/5 FSET

8	
1	
2	
3	
4	
5	
6	
7	
8	
9	
1	
2	
3	
4	
5	
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	

DISPLAYS

C/O+A+3 ACTIVE PLAN

C/O+B+3 ACTIVE OFFSET

C/O+C+3 ACTIVE FUNCTION SET

C/O+F+1 ACTIVE OVERLAP SET

C/O+F+2 ACTIVE DETECTOR SET

C/O+F+3 ACTIVE PHASE BANK

C/O+C+6 COMMANDED DURATION TIME

C/O+A+2 PLAN FROM CENTRAL'S WIRE

C/O+B+2 OFF FROM CENTRAL'S WIRE

C/O+C+2 VIEW OF FSET COMMANDED

C/O+A+5 TBC PLAN REQUESTED

C/O+B+5 TBC OFFSET REQUESTED

C/O+C+5 TBC FUNC SET REQUESTED

C/O+F+D PHASE HOLD

C/O+F+E PHASE NEXT

C/O+F+F PHASE FORCE OFF

&O + C CURRENT HR/MIN/DOW

&O + 1 CURRENT DOM/YR/MON/SEASON

&O + 9 TBC TYPE 1 RESET TIME

&O + F CURRENT MIN/SEC

&O + 4 LAST POWER FAIL TIME

&O + 5 LAST POWER FAIL DATE

F/1+0+D # OF LONG POWER FAILURES

C/O+A+E CALC. MIN CYCLE LENGTH

C/O+B+E CALC. MAX CYCLE LENGTH

C/O+D+E CORD FAIL READS BAD C IN DISPLAY

&O + D FAILED PLN/FSET/HS SKIPPED

C/O+A+0 MASTER CYCLE

C/O+D+0 LOCAL CYCLE–RING B

C/O+B+0 LOCAL CYCLE–RING A

C/O+B+F CURRENT CYCLE LENGTH

MANUAL COMMANDS

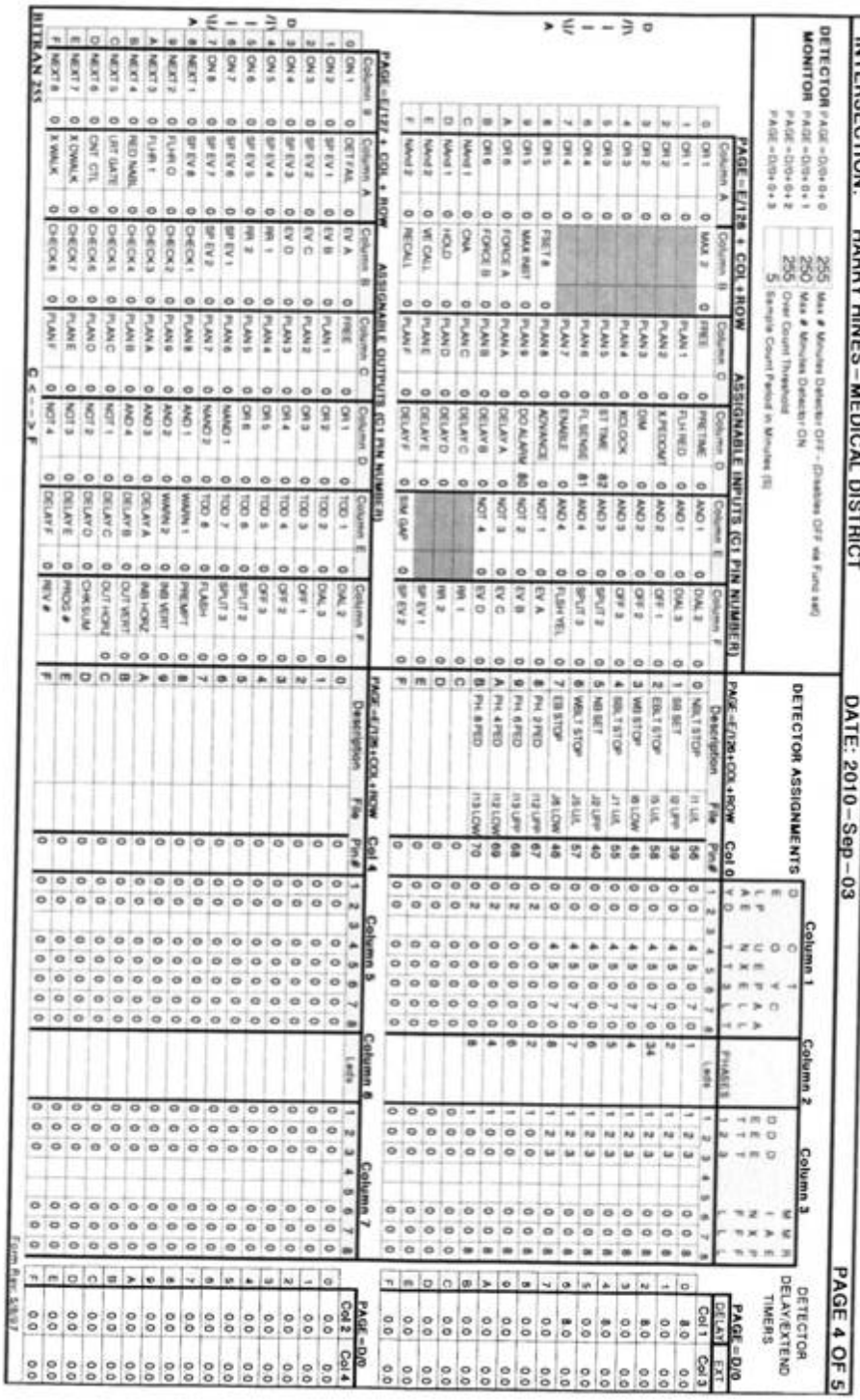
C/O+A+1 MANUAL PLAN

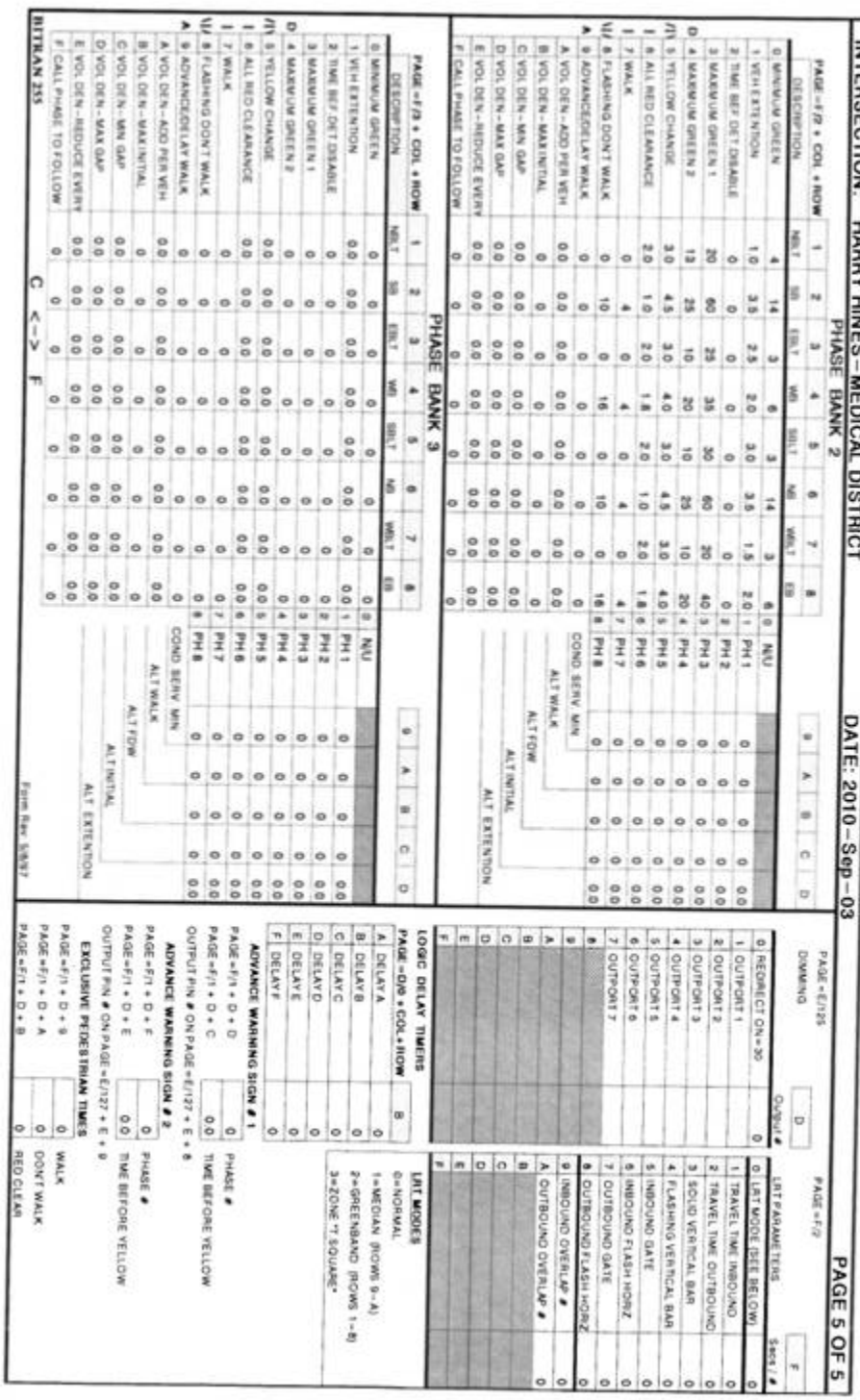
C/O+B+1 MANUAL OFFSET

C/O+C+1 VIEW OF MANUALED FSET

O+REMOTE 32=ALL RED FLASH

33=PROG Y/R FLASH 34=FREE


INTERSECTION: HARRY HINES – MEDICAL DISTRICT
DATE: 2010 – Sep – 03
PAGE 4 OF 5
DETECTOR ASSIGNMENTS
DETECTOR DELAY/EXTEND TIMERS
ASSIGNABLE INPUTS (G1 PIN NUMBER)
ASSIGNABLE OUTPUTS (G1 PIN NUMBER)
BITRAN 255


INTERSECTION: HARRY HINES – MEDICAL DISTRICT
DATE: 2010–Sep–03
PAGE 5 OF 5
PHASE BANK 2
PHASE BANK 3
PAGE=F/9 + COL + ROW
DESCRIPTION
MIN T
SEC T
EXT T
VAR
SEC T
MIN
VAR T
EXT
0 MINIMUM GREEN
1 VEH EXTENSION
2 TIME BEF DET DISABLE
3 MAXIMUM GREEN 1
4 MAXIMUM GREEN 2
5 YELLOW CHANGE
6 ALL RED CLEARANCE
7 WALK
8 FLASHING DONT WALK
9 ADVANCE/DELAY WALK
A VOL DEN – ADD PER VEH
B VOL DEN – MAX INITIAL
C VOL DEN – MIN GAP
D VOL DEN – MAX GAP
E VOL DEN – REDUCE EVERY
F CALL PHASE TO FOLLOW
NEMA
ALT WALK
ALT FDW
ALT INITIAL
ALT EXTENTION
COND SERV MIN
PAGE=E/126
DIMMING
OUTPUT #
REDIRECT ON=30
OUTPORT 1
OUTPORT 2
OUTPORT 3
OUTPORT 4
OUTPORT 5
OUTPORT 6
OUTPORT 7
LRT PARAMETERS
LRT MODE (SEE BELOW)
TRAVEL TIME INBOUND
TRAVEL TIME OUTBOUND
SOLID VERTICAL BAR
FLASHING VERTICAL BAR
INBOUND GATE
INBOUND FLASH HORIZ
OUTBOUND GATE
OUTBOUND FLASH HORIZ
INBOUND OVERLAP #
OUTBOUND OVERLAP #
LRT MODES
0=NORMAL
1=MEDIAN (ROWS 9–A)
2=GREENBAND (ROWS 1–8)
3=ZONE "I" SQUARE"
LOGIC DELAY TIMERS
PAGE=D/9 + COL + ROW
DELAY A
DELAY B
DELAY C
DELAY D
DELAY E
DELAY F
ADVANCE WARNING SIGN # 1
PHASE #
PAGE=F/1 + D + C
TIME BEFORE YELLOW
OUTPUT PIN # ON PAGE=E/127 + E + 8
ADVANCE WARNING SIGN # 2
PAGE=F/1 + D + F
PAGE=F/1 + D + E
OUTPUT PIN # ON PAGE=E/127 + E + 9
EXCLUSIVE PEDESTRIAN TIMES
PAGE=F/1 + D + 9
WALK
PAGE=F/1 + D + A
DONT WALK
PAGE=F/1 + D + 8
RED CLEAR
BITRAN 255
C <–> F
Form Rev 5/8/97

INTERSECTION: 3400 - Hwy 183 & Riverbend — CITY OF FORT WORTH — Page 1 of 10

Last Database Change: 11/22/2011 10:02

Conflict Flash Directions

Riverbend	RED
Hwy 183	RED

Revised Timing Sheets for ITS-Project 5:	Date	By:
Revised Timing Sheets	01/14/10	BW
	11/22/11	BW

[B] COCOE [B]

Drop Number	32	C00
Zone Number	1	C01
Area Number	1	C02
Area Address	93	C03
QuicNet Channel	COM31:	

Communication Addresses

Manual Plan
0 = Auto
1-9 Plan
14 = Free
15 = Flash
Man Plan [B]COCOE[B]

Manual Offset
0 = Auto
1 = Offset A
2 = Offset B
3 = Offset C
Man Offset[B]COCOE[B]

CA1	14
CB1	0

Manual Diamond
0=Nema Phasing
3=Figure 3 Phasing
4=Figure 4 Phasing
[B] COCOE [B] CA8

0

[B] COF1E [B]
Start / Revert Times

0	Flash Start	F0E
5.0	Red Revert	F0F
5.0	All Red Start	FC0

Miscellaneous Timing

Exclusive Ped Phase

Exclusive Walk	0	<F/1+0+0>
Exclusive FDW	0	<F/1+0+1>
All Red Clear	0.0	<F/1+0+2>

Miscellaneous Timing
(Output's specified in Assignments
Outputs at E/127+A+E & F)

[B] COF1E [B] F+COL+ROW (ENTER VALUE) + E

Row	Street Names	1 Vicky WBLT	2 Vicky EB	3 RB NBLT	4 183/V SB	5 Vicky EBLT	6 Vicky WB	7 183/V SBLT	8 RB NB
0	Direction								
1	Ped Walk	0	0	0	0	0	7	0	7
2	Ped FDW	0	0	0	0	0	10	0	20
3	Min Green	8	15	8	10	8	15	8	10
4	Type 3 Disconnect	0	20	0	20	0	20	0	20
5	Added per Vehicle	0.0	1.5	0.0	2.0	0.0	1.5	0.0	2.0
6	Veh Extension	2.0	4.5	2.0	3.0	2.0	4.5	2.0	3.0
7	Max Gap	2.0	6.5	2.0	3.0	2.0	6.5	2.0	2.0
8	Min Gap	2.0	2.5	2.0	3.0	2.0	2.5	2.0	2.0
9	Max Limit	30	60	20	60	30	60	20	60
A	Max Limit 2	30	50	30	40	30	50	30	40
B	Adv. / Delay Walk	0	0	0	0	0	0	0	0
C	EV Min Ped FDW	7	7	7	7	7	7	7	7
D	Cond Serv Check	10	10	10	10	10	10	10	10
E	Reduce Every	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
F	Yellow Change	3.9	3.9	3.9	3.9	3.9	3.9	3.2	3.9
	Red Clear	2.4	2.4	1.0	2.4	2.4	2.4	2.4	2.4

<0+0+F+1>

Phase Timing - Bank 1

Row	9	A	B	C	D
0					
1	Phase 1	0	0	0	0.0
2	Phase 2	30	0	0	0.0
3	Phase 3	0	0	0	0.0
4	Phase 4	20	0	0	0.0
5	Phase 5	0	0	0	0.0
6	Phase 6	30	0	0	0.0
7	Phase 7	0	0	0	0.0
8	Phase 8	20	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Alternate Timing

<C+0+F+1>

Row	E
0	
1	RR-1 Delay 0
2	RR-1 Clear 0
3	EV-A Delay 0
4	EV-A Clear 0
5	EV-B Delay 0
6	EV-B Clear 0
7	EV-C Delay 0
8	EV-C Clear 0
9	EV-D Delay 0
A	EV-D Clear 0
B	RR-2 Delay 0
C	RR-2 Clear 22
D	View EV Delay - - -
E	View EV Clear - - -
F	View RR Delay - - -
	View RR Clear - - -

Preempt Parameters

Row	F (LEDs) 12345678
0	Permit
1	Red Lock
2	Yellow Lock
3	Min Recall 2 6
4	Ped Recall
5	View Set Peds 6 8
6	Rest In Walk
7	Red Rest
8	Dual Entry 4 8
9	Max Recall
A	Soft Recall
B	Max 2
C	Cond. Service
D	Man Cntrl Calls 12345678
E	Yellow Start
F	First Phases 2 6

<0+0+F+1>

Phase Functions

Character Communications Values

	4	1	TX	RX
10				
11100111001	0011		25 9	219 15

	Y/N	DIRECTION	TYPE
PED BUTTONS NO HEADS:	N/A		N/A
PROTECT / PERMISSIVE:	N/A		N/A
POPP OPERATION:	N/A		N/A
NONLOOP DETECTORS:	N/A		332
TYPE OF CABINET:	N/A		

Notes

1. Phase 7 will not come on unless (1) RR Preempt is active and (2) there is a call on the left SB loop.

Printed on 12/13/2011 9:25 AM

City of Fort Worth Timing Sheet, Revision 2.9 — Timing Sheet Version: 233 RV2 Revision: 7105 — *BI Tran Systems, Inc. Sacramento, California*

INTERSECTION: 3400 - Hwy 183 & Riverbend — Last Database Change: Overlap **11/22/2011 10:02** — Page 2 of 10

[B] COF1E [B] F9E1E [B] COE29E [B] E+COL+ROW

Overlap (LEDs)	1	2	3	4	5	6	7	8
Street Name								
Direction								
0 Load Switch Number	0	0	0	0	0	0	0	0
1 OLap Set 1 - Phases								
2 OLap Set 2 - Phases								
3 OLap Set 3 - Phases								
4 Neg Veh Phases								
5 Neg Ped Phases								
6 Green Omit Phases								
7 Green Clear Omit Phs								
8								
9								
A								
B								
C								
D Green Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E Yellow Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F Red Clear	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

(LEDs)

Overlap Configuration <C+0+E=29>

[B]COE125E[B]EC + ROW

Row	C
0 EV-A	0
1 EV-B	0
2 EV-C	0
3 EV-D	0
4 RR-1 *	- - -
5 RR-2 *	- - -
6 SE-1	0
7 SE-2	0
8	
9	
A	
B	
C	
D	
E	
F	

Preempt Priority <C+0+E=125>
(* RR-1 is always Highest and RR-2 is second Highest)

Preempt Parameters

[B] COC5E[B] C2+ROW

Row	2
0 Phase 1	10
1 Phase 2	10
2 Phase 3	10
3 Phase 4	10
4 Phase 5	10
5 Phase 6	10
6 Phase 7	10
7 Phase 8	10
8	
9	
A	
B	
C	
D	
E	
F	

Coordination Transition Minimums <C+0+C=5>

[B] COF1E [B] F9E1E [B] COE125E [B] E+COL+ROW

(LEDs)	E	F
0 Exclusive Phases		
1 RR-1 Clear Phases		
2 RR-2 Clear Phases	3 8	
3 RR-2 Limited Service	2 567	
4 Prot / Perm phases	3 7	
5 Flash to PE Circuits		
6 Flash Entry Phases		6
7 Disable Yellow Range		
8 Disable Ovp Yel Range		8
9 Overlap Yellow Flash		
A EV-A Phases		
B EV-B Phases		
C EV-C Phases		
D EV-D Phases		
E Extra 1 Config. Bits	1 3 5	
F IC Select(Interconnect)	2	

Configuration Data <C+0+E=125>

[B] COF2E[B]FF+ROW

(LEDs)	F
0 Fast Green Flash Phase	
1 Green Flash Phases	
2 Flashing Walk Phases	
3 Guaranteed Passage	
4 Simultaneous Gap Term	12345678
5 Sequential Timing	
6 Advance Walk Phases	
7 Delay Walk Phases	
8 External Recall	
9 Start-up Overlap Green	
A Max Extension	
B Inhibit Ped Reservice	
C Semi-Actuated	
D Start-up Overlap Yellow	
E Start-up Vehicle Calls	12345678
F Start-up Ped Calls	

Phase Functions <C+0+F=2>

Coordination Functions

Row	0
0	
1	
2	
3	
4	
5	
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	

FL TO PREEMPT & PE NON-LOCK
1 = EV A
2 = EV B
3 = EV C
4 = EV D
5 = RR1 (Flash)
6 = RR2 (Lmtd Serv)
7 = SP EV1
8 = EV2

EXTRA 1 Flags
1 = TBC Type 1
2 = NEMA Ext Coor
3 = Daylight Savings
4 = EV Advance
5 = Expand Status Report
6 = International Ped
7 = Clear Outputs / Flash
8 = Split Ring

IC SELECT
2 = 2 Way Modem
3 = 7 Wire Slave
4 = Flash/Free
5 = N/U
6 = Simplex Master
7 = 7 Wire Master
8 = Offset Interrupt

Extra 2 Flags
1 = AWB During Initial
2 = LMU Installed
3= Disable Min Walk
4 = QuicNet/4 System
5 = Ignore P/P on EV
6 =
7 = Reserved

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[B] COC1E [B] C+COL+ROW (ENTER VALUE + E)

Row	PLAN	1	2	3	4	5	6	7	8	9
0	Cycle Length	100	100	100	100	100	100	100	100	100
1	Phase 1 - ForceOff	55	55	55	55	55	55	55	55	55
2	Phase 2 - ForceOff	0	0	0	0	0	0	0	0	0
3	Phase 3 - ForceOff	20	20	20	20	20	20	20	20	20
4	Phase 4 - ForceOff	40	40	40	40	40	40	40	40	40
5	Phase 5 - ForceOff	55	55	55	55	55	55	55	55	55
6	Phase 6 - ForceOff	0	0	0	0	0	0	0	0	0
7	Phase 7 - ForceOff	20	20	20	20	20	20	20	20	20
8	Phase 8 - ForceOff	40	40	40	40	40	40	40	40	40
9	Ring Offset	0	0	0	0	0	0	0	0	0
A	Offset 1	0	0	0	0	0	0	0	0	0
B	Offset 2	0	0	0	0	0	0	0	0	0
C	Offset 3	0	0	0	0	0	0	0	0	0
D	Perm 1 - End	15	15	15	15	15	15	15	15	15
E	Hold Release	255	255	255	255	255	255	255	255	255
F	Zone Offset	0	0	0	0	0	0	0	0	0

Coordination Timing 1 <C+0+C=1>

[B] COC2E [B] C+COL+ROW (ENTER VALUE + E)

Row		0	1	2	3	4	5	6	7	8	9
0	Ped Adjustment	0	0	0	0	0	0	0	0	0	0
1	Perm 2 - Start	0	0	0	0	0	0	0	0	0	0
2	Perm 2 - End	0	0	0	0	0	0	0	0	0	0
3	Perm 3 - Start	0	0	0	0	0	0	0	0	0	0
4	Perm 3 - End	0	0	0	0	0	0	0	0	0	0
5	Reservice Time	0	0	0	0	0	0	0	0	0	0
6	Reservice Phases										
7											
8	Pretimed Phases										
9	Max Recall										
A	Perm 1 Veh Phase	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
B	Perm 1 Ped Phase	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678	12345678
C	Perm 2 Veh Phase										
D	Perm 2 Ped Phase										
E	Perm 3 Veh Phase										
F	Perm 3 Ped Phase										

Coordination Timing 2 <C+0+C=2>

(Coord Extra Bit 1=Programmed WALK time for Sync Phases)

Row	Sync Phases	E
0	Plan 1 - Sync	2 6
1	Plan 2 - Sync	2 6
2	Plan 3 - Sync	2 6
3	Plan 4 - Sync	2 6
4	Plan 5 - Sync	2 6
5	Plan 6 - Sync	2 6
6	Plan 7 - Sync	2 6
7	Plan 8 - Sync	2 6
8	Plan 9 - Sync	2 6
9	NEMA Sync	
A	NEMA Hold	
B		
C	Coord Extra	
D		
E		
F		

Coordination Functions <C+0+C=1>

[B] COC1E [B] C+F+ROW (VALUE + E)

Row	Lag Phases	F
0	Free Lag	2 4 6 8
1	Plan 1 - Lag	2 4 6 8
2	Plan 2 - Lag	2 4 6 8
3	Plan 3 - Lag	2 4 6 8
4	Plan 4 - Lag	2 4 6 8
5	Plan 5 - Lag	2 4 6 8
6	Plan 6 - Lag	2 4 6 8
7	Plan 7 - Lag	2 4 6 8
8	Plan 8 - Lag	2 4 6 8
9	Plan 9 - Lag	2 4 6 8
A	External Lag	
B		
C		
D		
E		
F		

Coordination Functions <C+0+C=2>

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[B] COF1E [B] F9E1E [B] COE126E [B] E+COL+ROW

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0			NOT-3	0	Max 2	0	Pretimed	0	Set Monday	0	Dial 2 (7-Wire)	0	Sim Term	0	0
1			NOT-4	0	System Det 1	0	Plan 1	0	Ext. Perm 1	0	Dial 3 (7-Wire)	0	EV-A	71	1
2	Spec. Funct. 1	0	OR-4 (a)	0	System Det 2	0	Plan 2	0	Ext. Perm 2	0	Offset 1 (7-Wire	0	EV-B	72	2
3	Spec. Funct. 2	0	OR-4 (b)	0	System Det 3	0	Plan 3	0	Dimming	0	Offset 2 (7-Wire	0	EV-C	73	3
4	NAND-3 (a)	0	OR-5 (a)	0	System Det 4	0	Plan 4	0	Set Clock	0	Offset 3 (7-Wire	0	EV-D	74	4
5	NAND-3 (b)	0	OR-5 (b)	0	System Det 5	0	Plan 5	0	Stop Time	82	Free (7-Wire)	0	RR-1	51	5
6	NAND-4 (a)	0	OR-6 (a)	0	System Det 6	0	Plan 6	0	Flash Sense	81	Flash (7-Wire)	0	RR-2	52	6
7	NAND-4 (b)	0	OR-6 (b)	0	System Det 7	0	Plan 7	0	Manual Enable	**53**	Excl. Ped Omit	0	Spec. Event 1	0	7
8	OR-7 (a)	0	Fig 3 Diamond	0	System Det 8	0	Plan 8	0	Man. Advance	**80**	NOT-1	0	Spec. Event 2	0	8
9	OR-7 (b)	0	Fig 4 Diamond	0	Max Inhibit (ner	0	Plan 9	0	External Alarm	**52**	NOT-2	0	External Lag	0	9
A	OR-7 (c)	0	AND-4 (a)	0	Force A (nema	0	DELAY-A	0	Phase Bank 2	0	OR-1 (a)	0	AND-1 (a)	0	A
B	OR-7 (d)	0	AND-4 (b)	0	Force B (nema	0	DELAY-B	0	Phase Bank 3	0	OR-1 (b)	0	AND-1 (b)	0	B
C	OR-8 (a)	0	NAND-1 (a)	0	C.N.A. (nema)	0	DELAY-C	0	Overlap Set 2	0	OR-2 (a)	**52**	AND-2 (a)	0	C
D	OR-8 (b)	0	NAND-1 (b)	0	Hold (nema)	0	DELAY-D	0	Overlap Set 3	0	OR-2 (b)	**252**	AND-2 (b)	0	D
E	OR-8 (c)	0	NAND-2 (a)	0	Max Recall	0	DELAY-E	0	Detector Set 2	**202**	OR-3 (a)	0	AND-3 (a)	0	E
F	OR-8 (d)	0	NAND-2 (b)	0	Min Recall	0	DELAY-F	0	Detector Set 3	0	OR-3 (b)	0	AND-3 (b)	0	F

Input Assignments <C=0+E=126>

[B] COF1E [B] F9E1E [B] COE127E [B] E+COL+ROW

Row	Column 9		Column A		Column B		Column C		Column D		Column E		Column F		Row
0	Phase ON - 1	0	Preempt Fail	0	Flasher 0	0	Free	0	NOT-1	0	TOD Out 1	0	Dial 2 (7-Wire)	0	0
1	Phase ON - 2	0	Sp Evnt Out 1	0	Flasher 1	0	Plan 1	0	OR-1	0	TOD Out 2	0	Dial 3 (7-Wire)	0	1
2	Phase ON - 3	0	Sp Evnt Out 2	0	Fast Flasher	0	Plan 2	0	OR-2	**202**	TOD Out 3	0	Offset 1 (7-Wire)	0	2
3	Phase ON - 4	0	Sp Evnt Out 3	0	Fig 3 Diamond	0	Plan 3	0	OR-3	0	TOD Out 4	0	Offset 2 (7-Wire)	0	3
4	Phase ON - 5	0	Sp Evnt Out 4	0	Fig 4 Diamond	0	Plan 4	0	AND-1	0	TOD Out 5	0	Offset 3 (7-Wire)	0	4
5	Phase ON - 6	0	Sp Evnt Out 5	0			Plan 5	0	AND-2	0	TOD Out 6	0	Free (7-Wire)	0	5
6	Phase ON - 7	0	Sp Evnt Out 6	0			Plan 6	0	AND-3	0	TOD Out 7	0	Flash (7-Wire)	0	6
7	Phase ON - 8	0	Sp Evnt Out 7	0			Plan 7	0	NOT-2	0	TOD Out 8	0	Preempt	0	7
8	Ph. Check - 1	0	Sp Evnt Out 8	0	NOT-3	0	Plan 8	0	EV-A	0	Adv. Warn - 1	0	Low Priority A	0	8
9	Ph. Check - 2	0			NOT-4	0	Plan 9	0	EV-B	0	Adv. Warn - 2	0	Low Priority B	0	9
A	Ph. Check - 3	0	Detector Fail	0	OR-4	0			EV-C	0	DELAY-A	0	Low Priority C	0	A
B	Ph. Check - 4	0	Spec. Funct. 1	0	OR-5	0			EV-D	0	DELAY-B	0	Low Priority D	0	B
C	Ph. Check - 5	0	Spec. Funct. 2	0	OR-6	0	NAND-3	0	RR-1	0	DELAY-C	0			C
D	Ph. Check - 6	0	Central Control	0	AND-4	0	NAND-4	0	RR-2	**252**	DELAY-D	0			D
E	Ph. Check - 7	0	Excl. Ped DW	0	NAND-1	0	OR-7	0	Spec. Event 1	0	DELAY-E	0			E
F	Ph. Check - 8	0	Excl. Ped WK	0	NAND-2	0	OR-8	0	Spec. Event 2	0	DELAY-F	0			F

Output Assignments <C=0+E=127>

INTERSECTION: 3400 - Hwy 183 & Riverbend

[B] C0F2E F+COL+ROW (ENTER VALUE + E)

Row	STREET	1 Vickry	2 Vickry	3 RB	4 183/V	5 Vickry	6 Vickry	7 183/V	8 RB
	Direction	WBLT	EB	NBLT	SB	EBLT	WB	SBLT	NB
0	Ped Walk	0	7	0	7	0	7	0	7
1	Ped FDW	0	15	0	15	0	15	0	15
2	Min Green	4	7	4	4	4	7	4	4
3	Type 3 Disconnect	0	20	0	20	0	20	0	20
4	Added per Vehicle	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0
5	Veh Extension	2.0	4.0	2.0	2.5	2.0	4.0	2.0	2.5
6	Max Gap	3.0	6.0	3.0	3.0	3.0	6.0	3.0	3.0
7	Min Gap	0.5	2.0	0.5	1.5	0.5	2.0	0.5	1.5
8	Max Limit	20	30	20	25	20	30	20	25
9	Max Limit 2	30	50	30	40	30	50	30	40
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	EV Min Ped FDW	7	7	7	7	7	7	7	7
C	Cond Serv Check	10	10	10	10	10	10	10	10
D	Reduce Every	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E	Yellow Change	3.0	4.0	3.0	3.0	3.0	4.0	3.0	3.0
F	Red Clear	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Phase Timing - Bank 2 <C=0+F=2>

	9	A	B	C	D
	---	---	---	---	---
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Alternate Timing

[B] COF3E F+COL+ROW (ENTER VALUE + E)

Row		1	2	3	4	5	6	7	8
0	Ped Walk	0	7	0	7	0	7	0	7
1	Ped FDW	0	15	0	15	0	15	0	15
2	Min Green	4	7	4	4	4	7	4	4
3	Type 3 Disconnect	0	20	0	20	0	20	0	20
4	Added per Vehicle	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0
5	Veh Extension	2.0	4.0	2.0	2.5	2.0	4.0	2.0	2.5
6	Max Gap	3.0	6.0	3.0	3.0	3.0	6.0	3.0	3.0
7	Min Gap	0.5	2.0	0.5	1.5	0.5	2.0	0.5	1.5
8	Max Limit	20	30	20	25	20	30	20	25
9	Max Limit 2	30	50	30	40	30	50	30	40
A	Adv. / Delay Walk	0	0	0	0	0	0	0	0
B	EV Min Ped FDW	7	7	7	7	7	7	7	7
C	Cond Serv Check	10	10	10	10	10	10	10	10
D	Reduce Every	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
E	Yellow Change	3.0	4.0	3.0	3.0	3.0	4.0	3.0	3.0
F	Red Clear	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Phase Timing - Bank 3 <C=0+F=3>

	9	A	B	C	D
	---	---	---	---	---
Phase 1	0	0	0	0	0.0
Phase 2	0	0	0	0	0.0
Phase 3	0	0	0	0	0.0
Phase 4	0	0	0	0	0.0
Phase 5	0	0	0	0	0.0
Phase 6	0	0	0	0	0.0
Phase 7	0	0	0	0	0.0
Phase 8	0	0	0	0	0.0

Max Initial
Alternate Walk
Alternate FDW
Alternate Initial
Alternate Extension

Alternate Timing

Transition Type
0.X = Shortway
1.X = Dwell
X.1 Thru X.4 = Number of Cycles when lengthing.

Low Priority
1 = Channel A
2 = Channel B
3 = Channel C
4 = Channel D

COC5E [B] C+1+9
Transition Type 0.3 <C/5+1+9>
TBC Transition

COC5E [B] C+1+A
Lag Hold Phases <C/5+1+A>
Coordinated Lag Hold Phases

[B] COC5E [B] C1C
Sync Output Time 0.0 <C/5+1+C>
7-Wire Master

Begin Month 3 <C/5+2+A>
Begin Week 2 <C/5+2+B>
End Month 11 <C/5+2+C>
End Week 1 <C/5+2+D>
Daylight Savings Time

Time Before Yellow <F/1+C+E>
Phase Number 0 <F/1+C+F>
Advance Warnir 0.0

Time Before Yellow 0.0 <F/1+D+E>
Phase Number 0 <F/1+D+F>
Advance Warning Beacon - Sign 2

Long Failure 0.7 <F/1+0+6>
Short Failure 0.7 <F/1+0+7>
Power Cycle Correction (Default = 0.5)

Min Time (seconds) 4 <F/1+0+8>
Min Green Before PE Force Off

Max Time (minutes) 255 <F/1+0+9>
Max Preempt Time Before Failure

Min Time (seconds) 0 <F/1+0+A>
Min Time Between Same Preempts
(Does Not Apply To Railroad Preempt)

Low Pri. Channel <E/125+C+8>
Disable Low Priority Channel

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<C+0+E+126>

Row	Detector Name	C1 Pin Number	0 Attributes	1 Phase(s)	2 Assign	3
0	2 - 1 EB	39	45 7	2	123	8
1	6 - 1 WB	40	45 7	6	123	8
2	4 - 1 SB	41	45 7	4	123	8
3	3 - 1 NBLT	42	45 7	3	123	8
4	0	43	45 7	2	123	8
5		44	45 7	6	123	8
6	4 - 2 SB	45	45 7	4	123	8
7	8 - 1 NB	46	45 7	8	123	8
8		47	67	2	123	8
9		48	67	6	123	8
A		49	67	4	123	8
B	8 - 2 NB	50	67	8	123	8
C	5 - 1 EBLT	55	45 7	5	123	8
D	1 - 1 WBLT	56	45 7	1	123	8
E	7 - 1 SBLT	41	45 7	7	2	8
F		53	45 7	3	123	8

Detector Attributes <C+0+E+126>

[B]CODE[B] D+COL+ROW

<C+0+D=0>

Row	Detector Name	0 Delay	1 Extend	2 Delay	3 Carry-over
0		0.0	0.0	0.0	0.0
1		0.0	0.0	0.0	0.0
2		0.0	0.0	0.0	0.0
3		0.0	0.0	0.0	0.0
4		0.0	0.0	0.0	0.0
5		0.0	0.0	15.0	0.0
6		0.0	0.0	0.0	0.0
7		0.0	0.0	0.0	0.0
8		0.0	0.0	0.0	0.0
9		0.0	0.0	0.0	0.0
A		0.0	0.0	15.0	0.0
B		0.0	0.0	0.0	0.0
C		0.0	0.0	0.0	0.0
D		0.0	0.0	0.0	0.0
E		0.0	0.0	0.0	0.0
F		0.0	0.0	0.0	0.0

Detector Timing

Detector Attributes

1 = Full Time Delay
2 = Ped Call
3 =
4 = Count
5 = Extension
6 = Type 3
7 = Calling
8 = Alternate

Detector Assignments

1 = Det. Set #1
2 = Det. Set #2
3 = Det. Set #3
4 =
5 =
6 = MIN Recall on Failure
7 = Max Recall on Failure
8 = Report on Failure

<C+0+E=127> [B] COF1E [B] F9E1E [B] COE127E [B] E+COL+ROW

Column Numbers --->	1 Ped / Phase	2 Overlap	3	4	5	6	7	8	Row
Walk	0	0	0	0	0	0	0	0	0
Don't Walk	0	0	0	0	0	0	0	0	1
Phase Green	0	0	0	0	0	0	0	0	2
Phase Yellow	0	0	0	0	0	0	0	0	3
Phase Red	0	0	0	0	0	0	0	0	4
Overlap Green	0	0	0	0	0	0	0	0	5
Overlap Yellow	0	0	0	0	0	0	0	0	6
Overlap Red	0	0	0	0	0	0	0	0	7

Output Redirection <C+0+E=127>

<E+125+D+0>

Cabinet Type: 0

Enable Redirection (Enable Redirection = 30) (Disable Redirection = 0)

Max OFF (minutes): 20 <D0+0+1>

Max ON (minutes): 7 <D0+0+2>

Detector Failure Monitor

Row	D
0	Output Port 1
1	Output Port 2
2	Output Port 3
3	Output Port 4
4	Output Port 5
5	Output Port 6
6	Output Port 7
7	Dimming

<C+0+E=125>

[B]CODE[B]D+COL+ROW

Number of Digits	D
1 st Digit	0
2 ed Digit	0
3 ed Digit	0
4 ed Digit	0
5 ed Digit	0
6 ed Digit	0
7 ed Digit	0
8 ed Digit	0
9 ed Digit	0
10 th Digit	0
11 th Digit	0
12 th Digit	0
13 th Digit	0
14 th Digit	0
15 th Digit	0

Disable Alarms

1 = Stop Time
2 = Flash Sense
3 = Keyboard Entry
4 = Manual Plan
5 = Police Control
6 = External Alarm
7 = DetectorFailure

Omit Alarm: 7 <C5+F+0>

Disable Alarm Reporting

Time: 10 <C5+C+0>

Redial Time (minutes)

Row	B
A	DELAY-A 0
B	DELAY-B 0
C	DELAY-C 0
D	DELAY-D 0
E	DELAY-E 0
F	DELAY-F 0

Delay Logic Time (Seconds)

Dial-Back Telephone Number <C+0+C=5>

NEMA Cabinet Detector Table

Phase																
Pulse																
Pres																
Delay																
Extend																
Call Det																
Sys Det																

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[B] C090.1E[B] 9+ROW | [B] C071.0E [B] 7+ROW | *[B] C0E27E[B]E4+ROW | [B] C081.1E [B] 8+ROW | [B] C091.1E [B] 9+ROW

Row	Time	Plan	Offset		LEDs Day of Week	Time	Funct		LEDs Day of Week	Column 4 Phases/Bits	Day	Year	Month	LEDs Holiday Type	Time	Plan	Offset	LEDs Holiday Type
0	00 : 00	0	0	+E		00 : 00	E	+E	1234567	78	00	00	0		00 : 00	0	0	
1	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
2	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
3	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
4	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
5	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
6	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
7	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
8	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
9	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
A	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
B	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
C	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
D	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
E	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
F	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	

TOD Coordination <C+0+9+0.1> | TOD Function <C+0+7+1> | <C+0+E=27> | Holiday Dates <C+0+8+1.1> | Holiday Events <C+0+9+1.1>

[B]C090.2E[B]9+ROW | [B] C072.0E [B] 7+ROW | *[B]COE28E[B]E4+ROW | [B] C081.2E [B] 8+ROW | [B] C091.2E [B] 9+ROW

Row	Time	Plan	Offset		LEDs Day of Week	Time	Funct		LEDs Day of Week	Column 4 Phases/Bits	Day	Year	Month	LEDs Holiday Type	Time	Plan	Offset	LEDs Holiday Type
0	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
1	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
2	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
3	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
4	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
5	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
6	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
7	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
8	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
9	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
A	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
B	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
C	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
D	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
E	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	
F	00 : 00	0	0	+E		00 : 00	0	+E			00	00	0		00 : 00	0	0	

TOD Coordination <C+0+9+0.2> (Bank2) | Holidays TOD Function <C+0+7+2> | <C+0+E=28> *For Access F9E1E | Holiday Dates <C+0+8+1.2> (Bank2) | Holiday Events <C+0+9+1.2> (Bank2)

T.O.D. Functions
0 = Permit Phases
1 = Red Lock
2 = Yellow Lock
3 = Veh Min Recall
4 = Ped Recall
5 =
6 = Rest In Walk
7 = Red Rest
8 = Double Entry
9 = Veh Max Recall
A = Veh Soft Recall
B = Maximum 2
C = Conditional Service
D = Free Lag Phases
E = Bit 1 - Local Override
Bit 4 - Disable Detector OFF Monitor
Bit 7 - Detector Count Monitor
Bit 8 - Real Time Split Monitor
F=Output Bits 1-8

Plan Select
1 thru 9 = Coordination Plan 1 thru 9
14 or E = Free
15 or F = Flash

Offset Select
A = Offset A
B = Offset B
C = Offset C

Month Select
1 = January
2 = February
3 = March
4 = April
5 = May
6 = June
7 = July
8 = August
9 = September
A = October
B = November
C = December

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INTERSECTION: 3400 - Hwy 183 & Riverbend

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Output
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 1

<C+0+E=27>

TABLE #1
INPUT C1 PIN ASSIGNMENT:
(E/126 + F + 7) = ____

Notes:

0 <E/27+5+F>
Limited Service Interval

Row	6 Clear	7 Time	8 Ped Call	9 Hold	A Advance	B Force Off	C Vehicle Call	D Permit Phases	E Ped Omit	F Output
0		0								
1		0								
2		0								
3		0								
4		0								
5		0								
6		0								
7		0								
8		0								
9		0								
A		0								
B		0								
C		0								
D		0								
E		0								
F		0								

Special Event Schedule -- Table 2

<C+0+E=28>

TABLE #2
INPUT C1 PIN ASSIGNMENT:
(E/126 + F + 8) = ____

Notes:

0 <E/28+5+F>
Limited Service Interval

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Timing Sheet Version: 233 Rlv2 Revision: 71015

BI Tran Systems, Inc. Sacramento, California

Input File Slot No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
332 I FILE	1* Ext, Cnt, Call <C1-56>	2* Ext, Cnt, Call <C1-39>	2 Ext, Cnt, Call <C1-63>	2 Type 3, Call <C1-47>	3* Ext, Cnt, Call <C1-58>	4* Ext, Cnt, Call <C1-41>	4 Ext, Cnt, Call <C1-65>	4 Type 3, Call <C1-49>	1 Ext, Cnt, Call <C1-60>	NOT WIRED	Manual Advance <C1-80>	2 Ped Call <C1-67>	6 Ped Call <C1-68>	Flash Sense <C1-81>
		2 Ext, Cnt, Call <C1-43>	2 Ext, Cnt, Call <C1-76>			4 Ext, Cnt, Call <C1-45>	4 Ext, Cnt, Call <C1-78>		3 Ext, Cnt, Call <C1-62>		Manual Enable <C1-53>	4 Ped Call <C1-69>	8 Ped Call <C1-70>	Stop Time <C1-82>
										GPS Clock				
J FILE	5* Ext, Cnt, Call <C1-55>	6* Ext, Cnt, Call <C1-40>	6 Ext, Cnt, Call <C1-64>	6 Type 3, Call <C1-48>	7* Ext, Cnt, Call <C1-57>	8* Ext, Cnt, Call <C1-42>	8 Ext, Cnt, Call <C1-66>	8 Type 3, Call <C1-50>	5 Ext, Cnt, Call <C1-59>	NOT WIRED	Not Assigned <C1-54>	EV A Preempt <C1-71>	EV B Preempt <C1-72>	Railroad 1 <C1-51>
		6 Ext, Cnt, Call <C1-44>	6 Ext, Cnt, Call <C1-77>			8 Ext, Cnt, Call <C1-46>	8 Ext, Cnt, Call <C1-79>		7 Ext, Cnt, Call <C1-61>		Not Assigned <C1-75>	EV C Preempt <C1-73>	EV D Preempt <C1-74>	Railroad 2 <C1-52>

Input File Slot No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
336 I FILE	1 Ext, Cnt, Call <C1-56>	2 Ext, Cnt, Call <C1-39>	3 Ext Cnt, Call <C1-58>	4 Ext, Cnt, Call <C1-41>	5 Ext, Cnt, Call <C1-55>	6 Ext, Cnt, Call <C1-40>	7 Ext, Cnt, Call <C1-57>	8 Ext, Cnt, Call <C1-42>	Manual Advance <C1-80>	EV A Preempt <C1-71>	EV B Preempt <C1-72>	2 Ped Call <C1-67>	6 Ped Call <C1-68>	Flash Sense <C1-81>
	2 Type 3, Call <C1-47>	2 Ext, Cnt, Call <C1-43>	4 Type 3, Call <C1-49>	4 Ext, Cnt, Call <C1-45>	6 Type 3, Call <C1-48>	6 Ext, Cnt, Call <C1-44>	8 Type 3, Call <C1-50>	8 Ext, Cnt, Call <C1-46>	Manual Enable <C1-53>	EV C Preempt <C1-73>	EV D Preempt <C1-74>	4 Ped Call <C1-69>	8 Ped Call <C1-70>	Stop Time <C1-82>
							GPS Clock							

DETECTOR TYPES

Ext=Extension Detector. Detector is only active during the Phase's GREEN intervals (i.e. will NOT *Call* the Phase)

Cnt=Count Detector. Used in computing "Added Initial"

Call=Calling Detector. Detector is only active during the Phase's NON-GREEN intervals (i.e. will not *Extend* the Phase)

Type 3 = Type 3 Disconnect. Will allow a Calling Detector to Extend its phase until the Call first drops or the "Type 3 Limit" Is reached.

* These input file locations are connected to the cabinet detector switch.

Controller Intervals

0=Walk
1=FDW
2=Min.Green
3=
4=Var.Initial
5=Extension
6=
7=Reduce Gap
8=Red Rest
9=Preemption
A=Stop Time
B=Red Revert
C=Yellow - Gap Termination
D=Yellow - Max. Termination
E=Yellow - ForceOff Termination
F=Red Clearance

Continuous Memory Error Monitoring

The controller's RAM and EPROM memories are continuously checked for errors. checked for errors. If an error is found, the intersection will go into FLASH (via Watch Dog Timer), and one of the following will be shown on the controllers display:

bad A = An error was detected in the CPU's RAM, or a new program has been installed on the memory module. Often caused by a bad controller "gel-cell" battery.

bad b= An error was detected in the memory module's RAM. Often caused by a bad "Lithium" battery on the memory module.

bad E= An error was detected in the 233 program EPROM.

bad F= An error was detected in the Z-RAM (Dallas chip) on the memory module.

To request a download from a controller via the keypad. [B] C041E

This provides a download from the central computer to the intersection.
The 170 display will change to display 255 during the download. It changes to 0 when complete.
This only works if we have communications and the config. Bit 5 is set, Column E Row E on page 2.
It is prefered to call station 72 who can monitor the download and restart the download if needed.

Baud Rate for 170 Controllers

Use the settings on the following tables to set the serial port jumpers on the 170 CPU cards.

Voice Modem Locations

Serial	Port	Terminal	Use	Baud Rate	MHz
C2		ACIA 1	Communications	2400	38.4
C20		ACIA 2	Opticom	9600	153.6
C30		ACIA 3	Future Use	9600	153.6
C40		ACIA 4	Laptop	4800	76.8

Coax Modem Locations

Serial	Port	Terminal	Use	Baud Rate	MHz
C2		ACIA 1	Communications	4800	76.8
C20		ACIA 2	Opticom	9600	153.6
C30		ACIA 3	Future Use	9600	153.6
C40		ACIA 4	Laptop	4800	76.8

Railroad Preemption	
332 Cabinet	Pin 52
336 Cabinet	Pin 74 (If No EV D)

Procedure to create a new Intersection Timing Sheet

1. Configure the new intersection in QuicNet.
2. Add all of the timing values to QuicNet using QuicNet menus.
3. Choose print preview, add all of the extra data to the form.
4. Press the Save Data button on the Excel Spreadsheet.

Procedure to modify an existing Timing Sheet.

1. Choose print preview of the intersection to modify.
2. Make changes to the extra areas of the timing sheet.
3. Press the Save Data button on the excel timing sheet.

412/C Memory Module

Lithium Battery Condition

To check the condition of the 3.6 volt Battery on the 412/C Memory module:
C+O+E = 112
F/9/E = 1
E/O/A = **84 BAD**
85 GOOD

To Enable the E Page: F/1+9+E= Not Zero

READ OR SET TIME

Enter time at top of Minute
[B] 8+0 HR+MIN+0+E(at top of min)
...+ DOW (ACTIVATE LED'S)
[B] 8+1 DOM+YR+MONTH
[B] 8+F MIN+SEC
COCOE [B] C+F+F Force Off

Last Power Fail

COCOE [B] C+8+4 HR/MIN/DOW
COCOE [B] C+8+5 DOM-YR-MON

Last Cabinet Flash

COCOE [B] C+8+6 HR/MIN/DOW
COCOE [B] C+8+7 DOM-YR-MON

To Remotely Set Clock (GPS clock)

COCOE (B) 8+8 Set to 0500
E/128+D+4 (Set Clock) Set to 54 for 332's
50 for 336's or 79 for NEMA's

Find Chip Version Number

[B] F9E1E[B] COE128E[B] E9F
The display will be in HEX
41 = version 2.9
40 = version 2.8
39 = Version 2.7
38 = Version 2.6
37 = Version 2.5

DISPLAYS

COCOE [B] CA2 Master Plan
COCOE [B] CA3 Current Plan
COCOE [B] CA5 TOD Plan
COCOE [B] CA0 Master Cycle
COCOE [B] CB0 Ring A Cycle
COCOE [B] CD0 Ring B Cycle
COCOE [B] CAE Min Cycle
COCOE [B] CBE Max Cycle
COCOE [B] CBF Current Cycle
COCOE [B] CFD Phase Hold
COCOE [B] CFE Phase Next
COCOE [B] CFF Force Off

Procedure To Load Default Timing

Turn Stop Time switch to on position.
Hold down #1 button and turn on the 170.
Turn stop time switch to off position.

End of Appendix C